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A

SYSTEM

OF

DISSECTIONS,

EXPLAINING THE

ANATOMY OF THE HUMAN BODY,

THE

MANNER OF DISPLAYING THE PARTS, AND THEIR VARIETIES IN DISEASE.

THE SECOND EDITION.

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TO

DR. DANIEL RUTHERFORD,

PROFESSOR OF BOTANY IN THE UNIVERSITY OF EDINBURGH, AND PHYSICIAN TO THE ROYAL INFIRMARY,

&c. &c. &c.

THIS

FIRST VOLUME

OF A

SYSTEM OF DISSECTIONS

IS RESPECTFULLY DEDICATED,

BY

HIS OBEDIENT HUMBLE SERVANT,

CHARLES BELL.

PREFACE.

In the study of every science, it is necessary to present to young men such general views of the subject as may give them a lively interest in the pursuit; direct their inquiries to the points of real importance: and confirm in them manly and steady resolutions to persevere in learning the details and minutiæ. These details, though in themselves disagreeable, and tedious, are absolutely necessary; and no one who aims at useful knowledge, will acquiesce in general views, without endeavouring to follow them up and complete the investigation by studying the details from which they ought to follow, as legitimate conclusions.

In no department of science is attention to these two parts of study more indispensible, than in Anatomy; for while the details are intricate, they are often individually of the most serious importance to the life of man; and the general result, the economy of the human body, considered as a whole, is highly curious and interesting.

The common elementary books are often represented as sufficient for the student, and as comprehending the whole of Anatomy. But the object of such books is not practical anatomy, by which is to be understood the investigation, and knowledge of the dissected body. The descriptions are not adapted to the limited and successive views which in dissection we must have of the parts: they cannot be implicitly followed as guides. On the contrary, the anatomy of the parts implicated in a great operation, must be collected from different parts of the work —muscles from one place, blood-vessels from another, and nerves from a third. The descriptions too, will often be found insulated, and defective in such views as can give a lively interest, or any knowledge of the mutual dependence of the parts. Now it is quite right that elementary books should contain simple introductory and connected views, but the fault lies with those who would apply such works to wrong uses. From the arrangement necessary to their plan, the descriptions cannot be immediately compared with the dissected body. Dissection is the study of anatomy in the detail; and in books subservient to this study, more attention should be paid to the relative situation and contrast of parts, than to general views and rapid descriptions of the vessels or nerves. Thus more general and connected compends are essentially necessary, but they are to be taken as merely introductory to the study of anatomy by dissection.

That the common books are not fitted to be assistants in dissection, every one must allow who has taken the knife into his own hand, or been attentive to the operations in a dissecting-room. He will soon learn that in dissection it is not the want of minute description that is so much to be deplored, as the want of arrangements and plans on which to proceed. How often is it found that young men who have begun their anatomical labours with a sincere conviction of the importance of the study, and with the most determined resolution to combat all difficulties, have, for want of plan, gone to work in a manner so disorderly, that they have been soon bewildered, and forced to renounce in despair a pursuit which, with their views better directed, would have been easy and certainly most valuable to them.

The object of this work is to assist the student in acquiring a knowledge of practical anatomy; in gaining a local memory of the parts; in learning to plan them on the dead subject; and in representing them to his own mind upon the living body. In accomplishing this design it has been my object to present an arrangement adapted to the purposes of dissection; to give a short but a precise and accurate detail of the anatomy; to show how the parts are to be laid open, and how they are to be distinguished in dissection or avoided in operation; to explain the consequences of each part to the great functions of the body, and to mark the diseases to which it is liable, and the appearances which characterise that disease.

It has been my principal object to direct the thoughts of the dissector to matters of practice, being well convinced that the questions of practice are for the most part best discussed when the dissected body is before him.

For the execution of a plan of so much importance, much allowance must be made, for the subject is extensive and difficult, and the illustrations are to be drawn from the whole range of the science.

INTRODUCTION.

Dissection consists not merely in the management of the knife; it implies also a knowledge of the methods of injecting and preparing the parts, of investigating the structure of the viscera, and of presenting them for demonstration. For this reason I shall enumerate here the chief circumstances to be attended to as introductory to a common course of dissection, that they may be concentrated, and the body of the book freed from needless repetition. Practical anatomy, like all arts in which an aptness and dexterity of the hand is necessary, is to be acquired not hastily, nor by precept; but an ease and certainty in its operations can only be attained after much labour. All therefore which is necessary at present, may be said in a few words; and I shall, in the first place, give some advice on the management of injections, and the means employed for facilitating the dissection and demonstration of minute parts, and then point out the course of study to be pursued in the dissecting room.

Of injecting.—Injections have led to many useful discoveries in anatomy; but it is to be regretted, that experiments on the dead body have been too implicitly trusted to, in accounting for the functions of living bodies. Physiologists seem, indeed, to have become bolder in the extravagance of their theories, relying on supposed proofs by injection. Yet in spite of every disadvantage, the art of injection has contributed to the rapid advancement of our surgical knowledge.

In the choice of the subject, the bodies of young persons are to be preferred, as much fitter for the injection of the arteries, and for minute injection: for while their blood-vessels have an elasticity and strength which enables them to bear the push of the injection By a kind of elastic resistance, they give warning of the danger of rupturing the coats. In injecting the bodies of old persons, the piston of the syringe goes at first easily down, then stops, and if forced, most probaby bursts the vessels, driving the injection amongst the muscles, and confounding the dissection. When any of the trunks burst in this way, the tension being taken off, their coats contract upon the warm injection, and they remain half filled.

In old age, this want of elasticity becomes very remarkable. There is often a kind of stiffness and rigidity, as if the coats of the vessels were corrugated; a degree of that state in which we find the arteries when ossified, or when concretions are formed in their coats.

If only some coarse injection is to be thrown into the great vessels to shew their course, it does not much signify how it is done, or what injection is used, or what means are employed to facilitate the passage of the injection. But if the vessels are to be injected minutely, it is

previously necessary to heat the subject well, by laying it in warm water, or applying steam to the surface. This is of more consequence than even the choice of the subject; for, as the injection is intended to be fluid when warm, so as to pervade easily the minute vessels, and upon becoming cold to congeal and remain solid, it is necessary that the vessels be heated, to prevent the sudden chilling of the injection: besides this heating of the body softens and relaxes all the mass of flesh, and brings it to a more suitable state for admitting injection. But it ought to be remembered, that if the parts be overheated, especially where the vessels to be injected lie exposed, there is danger of corrugating the coats of the vessels, and making them quite friable and tender. The common practice in the injection of the great vessels, is, to take first equal parts of brown and white spirit varnish, coloured with the same paint that is used for the coarse or wax injection; and this fine varnish injection, being moderately heated, and thrown in before the wax injection, clears its way and moderately heats the vessels, so that they do not readily cool or retard the wax injection which is to follow. Even when using minute injection (which is size, coloured with vermilion) for the purpose of demonstrating the minute vessels, although the hard injection is thrown into the vessels after it, simply to stop the regurgitation of the warm and liquid size, and to retain it in the minute extremities of the vessels, yet it happens that the wax injection runs very minutely in this way. Size injection is the least expensive, runs more minutely, gives always a chance for beautiful specimens of minute injection, and can be pushed to any quantity, even till the skin of the limb becomes quite tense, without rupturing the vessels, or those vessels at least by which the coarse injection can escape. By this means, the vessels are dilated, the limb made warm and moist, and the wax injection flows easily into the arteries, whilst the size escapes with the slightest pressure into the cellular texture.

Care ought to be taken to exclude air and water from the arteries previously to the injection, lest they should retard or break the continuity of the wax in the arteries: but often, upon an emergency, injections of the arteries may be made by throwing in abundance of warm water before the wax. This, however, is not a practice to be followed; only it shews that it is rather the mixture of water or air along with the injection in the syringe, which is to be avoided; for, in that case, they will certainly be mixed in the vessels, and upon cooling, the wax will be found broken and interrupted.

As to the veins, on the contrary, if there be any air or water in them previously to throwing in the injection (at least in the extremities, where, on account of the valves, it is necessary to inject from the branches towards the trunks), the injection is then confined to the great vessels; and the air or water, not being allowed to escape by exudation, must remain interrupting the wax. The most effectual way of avoiding the mixture of air with the injection in the syringe, is, after having drawn it full, to hold up its point. This allows the air to rise to the top; and before introducing the nozzle of the syringe into the pipe, the piston should be pushed gently, till the injection appears at it.

Of the Injection of Veins.—The success of the injection of veins depends entirely upon their being well washed with warm water, and repeatedly dilated, as they are for the most part foul with coagulated blood, especially in old people; although, in other respects, the veins of old subjects are in the best state for injection, being enlarged and varicose. The coagula must frequently be drawn out of the mouths of the larger veins before introducing the tube. If the veins of the thigh and leg, for instance, are to be injected, the tube should be fixed in a small vein upon the fore part of the foot, near to the great toe; and a stop-cock should also be fixed into the external iliac vein, within Poupart's ligament. Then the blood must be washed out by throwing in tepid water from the tube at the toe; first, with the stop-cock open; and afterwards when the veins are a little cleared, the stop-cock at the top of the thigh is to be stopped, and the veins a little distended, and the limb immersed in warm water. Before injecting, the veins must be completely emptied by opening the stop-cock, and stroking up the thigh. The course injection should be thrown in while the limb is thus completely warm, and without any fine injection being thrown in before. During the injection, the stop-cock at the groin should be kept open, and some one placed to turn it when the injection appears at the mouth of the vein.—In this way, the air or water will be driven freely before the injection; and veins which would otherwise remain empty, will be filled; for by the dilatation, the valves lose their power, become too

small for the diameter of the vessels, and allow the injection to go backwards into the branches.

In filling the arteries with coarse injection, when extravasation or rupture of the vessel happens, it seems strange that the rupture is commonly in the trunk, and not in the smaller branches, since we know that the strength of the larger vessels is owing to their greater elastic resistance, whilst that of the lesser arteries arises from their muscular power, which must cease in the dead body. But there is an obvious reason for this: the rupture of the arteries often happens from using the injection too hot; and, as the great heat of the injection is in part corrected before it gains the extremities, they are not affected by it; while the root or trunk of the vessel being perpetually exposed to the hot stream, its coats are corrugated and burst. Besides, as the injection, when it cools, plugs up the smaller branches, the force of a heavy and unwary hand is exerted upon the trunks, where the injection, being yet fluid, they are dilatable. Accordingly we find, that, in throwing in cool and fine injection, the rupture is always towards the extremities.

From all this, it may easily be understood why, at first, the piston is to be pushed slowly and gradually, whilst throwing in the fine injection; insinuating the fluid into the more delicate vessels, which are very easily ruptured; scarcely pressing at first, but allowing the piston to go down with its own weight, and gradually increasing the force. The coarse injection again is to be thrown in with a smart push. This is the great delicacy in injection; and to accomplish it without danger of rupturing the vessels, is to be learnt only by practice.

There are still other things which require attention; viz. the tying of all the vessels that may have been opened, and the fixing of the tube securely in the mouth of the vessel. When the injecting pipe is introduced into the vessel, it cannot be retained there by a simple knot, without a chance of its slipping off during the injection, or, if tied firmly, of cutting the coats of the vessel. Therefore, after the ligature is drawn upon the artery including the tube, the ends of the ligature should be brought over the wings of the tube, and then carried round, so as to include that part of the ligature which reaches from the mouth of the tube to the wing; and being tied there, the former knot is at the same time tightened, and the mouth of the artery drawn up upon the barrel of the tube.

THE COMPOSITION OF THE INJECTION.

Coarse Injections.—The coarse injection is composed of the following ingredients. For good common injection, take tallow, one pound, resin, one pound, wax three ounces, Venice turpentine, two ounces, spirit of turpentine, one ounce. Or, bees-wax, sixteen ounces, resin, eight ounces, turpentine varnish, six ounces. The wax and resin give hardness and consistency; and the varnish is added to give it pliancy. A coarser composition may be made with tallow, wax, spirit of turpentine, and oil, coloured with the coarser paints; or, simply tallow and red lead, may be used when the parts are not to be preserved. These colours are generally used: vermillion, king's yellow, flake white, smalt, verditer, verdigrise, lamp black. They should be mixed with the turpentine varnish, and then added to the wax when melted; the injections should always be heated in an eathern pot set in boiling water, for water will not take a degree of heat to injure the colour, and the chance of accident by fire is, by this means, much diminished. The injection should not be thrown into the vessels while too warm, for it will hurt their coats: the degree of heat should be such, that the finger can be allowed to remain in it for a short time.

For fine injection to be thrown in before the coarse, equal parts of white and brown spirit varnish is commonly used.

For minute injection, painter's size, coloured and strained, serves every purpose; a finer size may be made of isinglass.

An injection to be used cold, and which is well adapted for class demonstration, or where the dissection is intended merely to demonstrate the vessels, without preserving them, may be made thus:—take red lead and linseed oil, and mix them till they are of the consistence of putty, add a little turpentine varnish, then a little spirit of turpentine, lastly, just before injecting it, sprinkle a little water into the mixture and agitate it. This injection runs very minutely, and for preparations there may added fine vermillion to heighten the colour.

Preparations of Bones.—It has already been observed, that the limbs, or any part of

the body, are easily dilated by the minute injection, in consequence of its escaping into the smaller vessels. This must, in some measure, be prevented, when it is intended to display the minute vascularity of membranes and joints, and more especially the vascularity of bones; for while the injection freely escapes into the dilatable cellular membrane, it will never penetrate into the more resisting parts, as the bones and cartilages; therefore, when a minute injection of the bones and cartilages is intended, a bandage must be rolled from the toes to the upper part of the limb, not very tight, but so as to restrain the enlargement of the muscles and cellular membrane by the force of the injection. In this way, the minute vessels are filled, yet little extravasation allowed; for there is an equal resistance in the soft parts and in the bones, and the parts partake more equably of their natural proportion of the colouring fluid. By this precaution, the bones may be very successfully injected, so as to show the stages of ossification. And not in sound limbs only, but in cases of diseased bones, with open ulcerated surfaces, I have succeeded in the injection, by firmly bandaging the limbs; when, otherwise, the injection would readily have escaped, and important morbid preparations have remained useless.

The minute vascularity of a bone is to be shown, after injection, by a long maceration of it in diluted muriatic acid; which, by dissolving the earthy part of the bone, leaves the membranous and cartilaginous parts (in the interstices of which the earth was deposited) flexible, and without any character of bone but the form. In this state it is, like cartilage, soft and yielding, but fibrous, and the vessels will not be more discernible than before. The bone is to be thoroughly dried, and then plunged into a glass of clear spirit of turpentine; when, as soon as the spirit penetrates the cells, the bone becomes quite transparent, and the vessels easily distinguishable, branching through its substance.—In corroding shells to show the the glutinous basis in which their earthy part is laid, spirit of wine, with a little of the acid dropped into it, has been used, by which the delicate web is preserved, whilst the other parts are taken away. In the same manner, in the maceration of bones, when the maceration is expected to be tedious, it may be necessary to add spirit of wine to the menstruum to prevent the size in the vessels from being resolved and washed away.—The most beautiful preparation of bone is the simple section of the cartilage, or apophysis, in young subjects, where the injection has run minutely, and while the nucleus of the bone is still small and red with injection. This nucleus is seen lying in the middle of the cartilage, with the vessels crowding from the surface towards the centre, and terminating in the bone; or, perhaps, only a small and delicate artery is seen pushing into the centre of the cartilage, and terminating in a point the beginning of a future bone. The cartilages in this state, when cut in thin slices, and suspended in spirits of wine, are beautiful; or when those slices are dried and suspended in spirits of turpentine, the cartilage becomes so transparent that it is with difficulty discerned in the fluid, and nothing is seen but the nucleus of bone, with the arteries beautifully ramifying to supply it. Or, the nucleus of bone may be tinged by solution of some of the metals in acid, while the cartilage will remain perfectly white. Such preparations may be infinitely varied, forming the most beautiful examples of the changes going on, not only in the bones, but, by analogy, in the whole body.

The marrow, also, may be displayed, after injection, by maceration in water; or by slitting up the cylindrical bone, and preserving them in spirits of wine. When such a section of a bone is dried, and put in oil of turpentine, the vessels supplying the marrow bags, being collapsed to the side of the bone, are seen in great profusion.

The structure of bone is demonstrated, independently of injection, by maceration and burning. By exposing bones gradually to a red heat, and so placed that they may be equally supported, the animal part is burnt away, while the earthy part remains behind, a calcareous phosphat, retaining the figure of the bone, but deprived of its gluten and fibrous part, which gave it strength. This is just the reverse of what takes place in the corrosion with the muriatic acid. In the one case, the animal fibre is burnt away, leaving the secreted bony part in its original figure; in the other, the calcareous or osseous part is dissolved in the acid, the softer parts (which, when endowed with living properties, were capable of secreting this earthy part from the blood) remaining undissolved. These preparations, therefore, should be contrasted.

If a bone is burnt, and then put in acid, it is entirely destroyed. If, therefore, after burning it completely, warm wax be poured into its cavity, and it then be corroded in acid, the cells will be elegantly cast in wax.

For example, to make a cast of the intricate passages of the temporal bone, with a view to demonstrate the cavities of the internal ear, we first enclose the temporal bone in Paris plaster, leaving open the meatus externus: then dry it thoroughly by the fire and heating it gradually, at last throw it into the fire. When the bone is calcined take it out and pour melted lead into the passage of the ear; lastly, break off the Paris plaster, and put the bone into the muriatic acid, and you have a perfect cast of all the cavities of the ear.

Of Corrosions.—Corroded preparations are the most elegant of all, but require great care. They are generally made of the injections of the solid viscera; as the heart, lungs, liver, kidney, and spleen. Harder injection than common is required for these, and no minute injection need be thrown in before. If the injection succeed, the only other circumstance which requires care, is that we place the part while the injection is yet warm, as it is intended to remain, and where the corroding acid may be easily applied. When the fleshy part is dissolved, it is to be gently washed away by the agitation of the water; and it should not be attempted to be lifted out of the water till entirely freed from the parenchymatous matter, which, by its weight, might break the delicate branches. The menstrua are the muriatic and nitric acids; the latter of which M. Sue found a more perfect menstruum, and less apt to affect the colours of the injection or minute vessels.

Compositions of glass may also be used in making casts of many parts, as they admit of a great variety of transparent colours; the soft parts and the bones being burnt away, while the paste is acquiring its glassy surface.

Of Wet Preparations.—In preparing morbid parts, there are often appearances, curious and important, which cannot be preserved. Often in examining the parts, the colour is the only criterion by which the nature of the disease is to be determined: and this it is often impossible to preserve. Recourse must be had to painting, to give the lively tints which alone remain of the disease, &c. But even here injections may be of much service, as a means of making the parts more beautiful or natural, and more extensively useful, by preventing that confusion which is so often found in wet preparations having no distinctions of colour. Even in organic affections of the heart, lungs, intestines, &c. injection gives a splendor and and consequence which the real importance of these parts would perhaps claim in vain; and in preparing such parts, great expertness may be acquired in giving them natural or beautiful tinges, by injecting the vessels with coloured fluids.

In preserving thick fleshy parts in spirits, it will be necessary to inject spirits into their vessels; which thoroughly pervading them, tends greatly to preserve them. Liquors for preserving preparations have been much boasted of since the time of Ruysch; but to clean and unadulterated spirit of wine with distilled water there can be no objection. The spirit must be diluted according to the delicacy of the parts to be immersed in it. Sometimes when very delicate membranes are put up in pure spirits, they will be found next day shrivelled and shrunk up to the top of the jar; but by saturating the spirits with sugar, they lose this property, and the membrane hangs loosely in the jar. The glasses containing such membranous parts should be allowed to stand some time before being finally closed: for though the membrane, being full of water, when first put into the spirits, hangs elegantly enough; yet, when it has parted with its superabundance of water, and received the spirit, it will become so light, that it will swim upon the surface, and require little hooks of glass to be put to its lower parts to weigh it down.—Wet preparations often require to have the spirits changed upon them several times before they are finally put up, to prevent the possibility of their tinging the spirits after they are closed: Or, perhaps, it may be necessary that the parts, should be stuffed, or held out in particular postures, till they be so hardened, that they remain unsupported in the jar. For this purpose diluted muriatic acid and nitrous acid combined, is sometimes used; or the diluted nitrous acid simply; or a solution of alum and common salt. These give the parts firmness and strength to support themselves in the glass. Care must always be taken to macerate the parts well previously, and to free them entirely from blood.

When delicate membranes are to be injected either with quicksilver or with fine size, instead of tying all the vessels by which the fluid may escape, I have found it necessary only to sear the edges of the membrane with a heated iron; or, after having fixed the tubes, the common method is to dry the edges all round, while the middle part is kept soft and moist. When it is required to demonstrate the vascularity of a part where there is no opportunity of injecting it, if membranous, the blood may be detained in the vessels by

quickly drying and varnishing it. The blood, when extravasated, or when (as in the piles) preternaturally collected in vessels, may be coagulated by a solution of alum; or blood, in inflamed parts, may be coagulated by distilled vinegar. In other instances, as in preparations of the lacteals, their natural fluids may be coagulated and preserved by plunging them suddenly into strong spirits.

To demonstrate the rete vasculosum of the *retina*, a drop or two of solution of caustic alkali may be put into the spirits, by which the matter of the nerve is dissolved or made transparent, when the vessels of the nerve are beautifully displayed.

Demonstration of Minute Parts.—There are many parts of the body which it is impossible to keep for any time in their original beauty, and these the most delicate and interesting; as the organs of the senses, and all minute nervous parts, the villi of the intestines, the comparative anatomy of insects, the incumbated egg, &c. The ready demonstration of such delicate parts in the fresh subject is the truest test of the abilities of the practical anatomist; for there is more delicacy and nicety required in exposing these parts, and more benefit to be derived from it, than in making the more lasting preparations.—The minute structure of many of these parts must be dissected and unravelled under water, where the loose and floating membranes display themselves; while, out of the water, they would lie collapsed and undistinguished. In such investigations, I have found nothing of so much service as jelly made strong and quite transparent. When a delicate part is completely dissected (suppose it to be the coats of the eye,) place it in the jelly as it is becoming firm, and hold out the parts; they will be retained, elegantly displayed, either for demonstration or for drawing.

In some instances, (as in dissecting the eye and ear,) freezing mixtures have been employed, which allow the frozen parts to be dissected without the fluids escaping. It is not always with the knife that we must expect to dissect and separate the minute and transparent organs, but frequently the object is best attained by blowing betwixt the lamina: as of the pia mater, the capsule of the lens, the cellular coat of the intestines, &c.

In anatomising insects, two small and very delicate hooks are used, by which the parts are to be torn asunder; the attempt to dissect them with the knife will be quite vain. It is by this means that Mr. Macartney has succeeded so well in his preparations of comparative anatomy.

Boiling and maceration are often employed to demonstrate the muscularity of parts; as the course of the fibres in the heart. The course of the fibres in the bladder may also be shown, by distending it, and plunging it suddenly into boiling water. In this way, also, the coats of arteries, the rete mucosum of the skin, &c. may be demonstrated. Immersing the skin in boiling water before injection, is said to make the villi stand out more from the surface. Although immersing in boiling water will not separate membranes into their layers, sometimes alternately macerating them in cold and warm water will do it; or macerating till putrefaction takes place, and then plunging the part into boiling water, as is done to separate the cornea.

Boiling gently with a solution of nitre and alum is used to render evident the muscularity of membranous parts. The solution makes the muscular fibre of a red colour, but, perhaps, minutely injecting the parts is a more natural and effectual method; for, after a successful injection the muscular fibres of the bladder, for instance, being very vascular, become distinguishable.—Nervous membranes, as the expanded nerve of the eye and ear, the septa of the vitrous humour, and the membranes of the egg, become opake when vinegar is poured upon them. Without this, the latter cannot be distinguished.

To prepare for the demonstration of the brain, I have been in the use of injecting it minutely with fine size, which even if the brain happen to be soft, will give firmness, and enable one to display the parts better.

The brain and nerves, by being exposed to the oxygenated muriatic acid, are made firm. Immersed in a solution of corrosive sublimate and spirits, the brain is hardened and can be preserved. But to preserve preparations of the brain, spirit of wine, corrosive sublimate, and nitric acid combined, make the best liquor.

Of the Lymphatics.—The injection of the lymphatic vessels is the most difficult part of practical anatomy. The subject taken for lymphatics, should be under twenty-five years of age, and dropsical.—The apparatus in the shops is fit for every purpose; generally, however, the tube of glass is too thick, which makes it heavy and unwieldy when filled with

mercury. A provision of very fine forceps, scissars, lancets, needles, and thread, should be at hand, and the assistant must be equally adroit with the anatomist.—The mercury must be pure, and the globules leave no tract behind them.

Supposing that an extremity is to be injected: the veins and arteries should be previously injected. It is placed with the upper part of the limb a little inclined downward. The integuments are to be dissected off; the common cellular membrane left; lines will be perceived small as the most delicate nerves, but without their white opacity, and taking a course somewhat obliquely, crossing the cutaneous veins, below the ancle and on the wrist. It will be difficult to introduce the point of the smallest tube unless we proceed in this way. Having discovered a lymphatic, a delicate needle and thread is put round under it: then, with very fine scissars cut the filament half through. The scissars I use in preference to the lancet, as by snipping the lymphatic a little obliquely, an opening is made which is more easily found than a puncture. We may now inflate the vessels by the small blow-pipe, making the stream of air play on the punctured part of the vessel; but I never do this. I introduce into the vessel, the delicate steel poker, if it enters smoothly and without resistance, I know that it has found the vessel; if it is pushed on with difficulty, that it is making its way amongst the common cellular substance. When the poker is introduced, I then take the pipe with a high column of mercury and make the stream play along the poker, when the mercury never fails to enter the lymphatic; and now the point of the tube easily enters the distended vessel, when the poker is to be withdrawn.

The mercury should be allowed to flow freely: from one small vessel, on the wrist or foot, six or ten lymphatics may be filled on the thigh or arm. With similar precautions other vessels are to be sought and filled.

If we have to inject lymphatics betwixt the glands and trunk of the system, the pipe may be plunged into the glands so as to fill its cells, from which it will pass or may be pressed into the second set of vessels.

The lymphatics of any subject may be injected. We have them here injected and dissected for the lectures on that subject, in whatever body may offer in the rooms at that time, but when there is much fat the dissection of them is difficult, and to preserve them it is absolutely necessary that the subject shall be thin, and anasarcous.

When a limb is injected, it should be laid horizontally. We begin the dissection on the lower part; when we have dissected the vessel to some extent, a very fine thread is tied round it, and this ligature is repeated as we proceed up the limb, at the distance of five or six inches. When a vessel of, perhaps, three feet in length, is left without this interruption to the mercury, it cannot be expected that when the vessels dry, and the valves consequently shrink, the coats of the vessels will bear so high a column. It will always be remembered that it is the height of the column, not the quantity of mercury in the tube, or in the vessels, which governs the force with which it presses at the lower part.

At all times, but especially when the coats of the vessels have dried, it is necessary to keep the preparation in an uniform temperature. If the heat be increased the vessels will burst; if they are prepared in a warm temperature and removed into a colder place they will shrink.

I recommend to the student the perusal of Sheldon's Introduction on the Preparation of the Lymphatic Vessels.

OF A COURSE OF DISSECTIONS.

I advise the student to make himself perfectly master of the Bones, before he take part of a muscular subject. When he takes the knife first in hand, his object ought to be, to learn to use it with ease and freedom: to acquire a mobility of the wrist and fingers.

The assistant will first put him on a fleshy part, teach him to lay the edge of the knife to the individual fibres, and cut always in the course of the fibre. When he can make a clean dissection of the gluteous muscle, lifting the integuments at once, leaving the fibres distinct and clear of cellular membrane, the next step is to know the nature of cellular expansions, and the aponeurosis of muscles. He will find, for example, in dissecting the tendons of the abdominal muscles, that they are covered with thin layers of membrane, he will mark how all muscles are covered with these, and the demonstrator will take occasion to point out the necessary consequence of inflammation, or the growth of a tumour, or the protrusion of a hernia upon these layers of cellular membrane.

In the dissection of muscles and fasciæ, a large knife with a full convex edge, should be used; but, in the dissection of nicer parts, in following the nerves for example, small and straight, or lancet-pointed knives are necessary. Besides the common hook and forceps, if the student resolve to enter on minute dissection he should order the hook knives and forceps for the extraction of the cataract, he cannot expect that the instrument-maker will give him fit ones under an order for *dissecting instruments*.

During the dissections of the muscles, the mechanism of the joints, the classification of the muscles, their effect in fracture and dislocation, their anatomy as it regards hernia, &c. ought to be the object of study.

When the student is master of the muscles, he enters upon the dissection of the NERVES.

While the dissection of the muscles gives ease and freedom to the hand, the dissection of the nerves gives niceness and delicacy.

During a course of dissection of the nerves, we have two subjects of inquiry, connected with our subject: the one surgical strictly; the other pathological.—The connexion of the nerves with the arteries, and the places where it is likely or probable that they may be tied when the surgeon uses his needle to secure bleeding arteries, are to be noted. We must know the distribution, and the precise course of the nerves of the extremities. We must observe the branches which account for the various sympathies, and the consent of parts.—We must contemplate that wonderful tissue of nerves forming the system of the viscera.—In short, if we do our duty while we are dissecting the dead body, we shall take into consideration such phenomena of the living system as may correct the inaccurate, and too mechanical notions, which we are apt to receive from mere dissection.

To the surgeon, DISSECTION OF THE ARTERIES is not merely most necessary, but quite indispensable. Both heart and head must be wrong, when a young man allows himself to be put in situations of great responsibility, without having dissected the arteries; without having thought maturely of the chances of war, and of the equally great variety of open, and oblique, and torn wounds of the great vessels, which occur in domestic life.

During dissection there are many little operations which should be practised, and which are neglected. The introducing, for example, of probes into the ducts; as into the nasal duct, and puncta lacrymalia, and into the ducts of the salivary glands; the introducing of instruments into the nose and throat, and into the eustachian tube: the use of the probang, and of the catheter, &c. should be practised.—Knowledge and dexterity in such points often prove more useful, as being oftener required, than the greater operations of surgery. In dissection the integuments are to be preserved, that they may be laid down on the parts again, otherwise in the intervals of dissection, the surface contracts a mucus, and gets dry and foul: a wet cloth, which by evaporation may keep the body cool, is indispensable in warm weather.

In conclusion, I affirm, that the difference betwixt a young man that promises to be one who will improve his profession, and him who is merely tolerated as a practitioner, is this, the one seeks every occasion to be informed of what is going forward in the dissecting-room, while the other supinely does his task, and requires his certificate in writing.

The first body which the student dissects for the arteries may be done in the common way, as for making dried preparations. But after he has ascertained the principal bearings, as it were, of the great trunks in their course; and has made himself master of the branches of the arteries, their classification, and number, and proportional size; there remains a department of study which is to bring him nearer to the circumstances of actual practice. He ought to dissect a body with the arteries uninjected, that he may know them by their appearance and relations, as they will be in the living body, where else, he will sadly feel the want of the wax to inform him of what is artery, vein, and nerve! In this department of his study he should attend particularly to the depth of the vessels, the fasciæ by which they are surrounded, the muscles which are to be separated in order to penetrate to them, the precise bearing of the artery to such and such points of bone, or to the course of tendons, as may stand him good in the living body; and lastly, he ought carefully to observe the relation of the artery, vein, and nerve; where he may dive boldly with the needle; where cautiously separate the artery before he ties it.

A SYSTEM OF DISSECTIONS.

PART I.

CONTAINING

THE DISSECTION OF THE ABDOMINAL MUSCLES AND VISCERA.

A SYSTEM

OF

DISSECTIONS.

DISSECTION OF THE ABDOMINAL MUSCLES.

PART I.

THE dissection of the abdominal muscles is often the first that a student sees; and if it be carefully done, he is astonished to find the fleshy mass of the body separated into so many distinct parts, and is pleased with the appearance of the muscles exposed in all their beautiful variety of shapes and colours, the smoothness of their surface, and their silvery expanded tendons. But he conceives all this to be the simple exposition of the parts, not the effect of preserving labour; and if accustomed to the clear demonstration of a class dissection, has no idea of difficulty in the task. He feels the difficulty of dissection only when he takes the knife in his own hand, directed by that vague knowledge alone, which is, I fear, too common, and which consists more in a facility of repeating descriptions, than in a precise and clear idea of the situation of the parts. To begin a course of private dissections with such light ideas of the difficulty and importance of the task, and so poor a notion of practical anatomy, must produce in the student that disappointed and irritated state of mind, which is but ill calculated to carry him on with perseverance. He will find that there are many little observations to be made, and much accurate knowledge to be acquired of the appearance of parts, of vessels, of cellular substance, fascia and tendons, before he can go on confidently, and be sure of the course of his knife.

No dissection ought to be begun without maturely considering the parts which lie concealed, and all that is most worthy of labour. Following this method, I shall first describe the general outline of the parts to be dissected; and, secondly, the order of the dissection, and the pains that ought to arrest attention.

FIRST STAGE OF THE DISSECTION.

(Turn to Plate I.)

In the first dissection there is only one muscle on each side of the belly to be dissected; for the outer oblique muscle covers all the others.

The obliquus externus abdominis arises by triangular fleshy slips from the lower edge of the eight lowermost ribs, its muscular fibres proceed downwards obliquely over the cartilages of the ribs, and also obliquely downwards over the free space betwixt the borders of the chest and the spine of the ilium. Terminating its muscular part abruptly, it sends its expanded tendon over all the fore part of the belly, and is inserted into the spine of the ilium, into Poupart's ligament, into the os pubis, and into the

whole length of the linea alba, which is only the interlacing of this with the tendon of the muscle of the opposite side.

To make an incision from the sternum to the pubis through the integuments, make a second cut in a semicircular direction over the ribs through the integuments, covering the origin of the pectoralis major: now dissect down the angle of the flap of skin off the side of the chest; in doing this, be aware of the place of the *rectus* and do not mistake it for the origin of the *obliquus externus*, for then you will lift the tendon of the *obliquus externus* and destroy the dissection. As you proceed with the dissection, you will find the muscle covered by a thin expansion, adhering closely to the fibres—and if you take the fat and integuments off, leaving the muscle with the cellular substance and slight aponeurosis adhering to it, you will never make a clean muscle, however carefully you afterwards dissect it. You are therefore to carry your knife close to the surface of the muscle, and to disentangle its fibres from the membraneous covering and integuments by long and regular strokes carried in the direction of the fibre. This is the method which you ought to pursue in all muscular dissections, when there is no fascia to be exposed, nor branches of injected vessels to be avoided. But you are not to proceed in the same manner in the tendinous and fore part of the abdomen, at least in your first attempts; for you would be in danger of lifting the outer layers of this sheet of tendon of the external oblique muscle, and, deceived by the appearance of a beautiful shining surface (which may be the tendons of the lower layer of muscles,) destroy the beauty of the parts, and make confused and irregular work. Therefore take off the integuments in a mass from the fore part of the belly; and when you see all the general surface exposed, you cannot proceed far in dissecting off the condensed cellular substance from the surface of the tendon, without observing the confusion into which such irregularity will lead you.

In the course of this single muscle, all these points must be minutely attended to—the *linea alba*, the *linea semilunaris*, the *ring of the umbilicus*, and the anatomy of the *inguinal ring*.

To understand these lines which divide the tendon of the external oblique muscle, it is necessary to remember the situation of the recti muscles. They reach from the sternum to the os pubis. Each arises from an extensive adhesion to the outer surface of the sternum, and to the cartilages of the lower true ribs, and proceeding down in the middle of the belly, included in an appropriated sheath, is inserted into the os pubis. This sheath is stronger upon its outer part, because when the body is strongly bent forwards, and the surface of the belly is concave, the recti muscles, were they only held by the elastic skin, would start from their places, and make a direct line from the sternum to the pubis, and much of the effect of their contraction would be lost; but this strong sheath in which they are included, being composed of the tendons of the broad lateral muscles, is drawn laterally at the same time, and consequently the recti acting thus in a curve, more powerfully draw the thorax towards the pubis. The sheath of each rectus muscle, as I have said, is formed by the tendons of the flat muscles of the belly, proceeding from behind forwards. These mingle their tendons more intimately together, when they reach the side of the rectus muscle, which appears externally as a *white semilunar line* running round in the direction of the skirts of the rectus muscle—and these broad tendons splitting again, include the rectus in their duplicature, and meeting beyond that muscle, they form the tendinous white line in the middle of the belly, called the *linea alba*. The rectus muscle, does not run unconnected in this sheath nor does it form one continued tract of muscular fibre; but the intermediate tendons which divide it into square muscular portions, are firmly connected with the sheath, while the muscular part adheres to it by loose cellular substance. Therefore when the external muscle of the belly is carefully dissected, you can distinguish these parts: *first*, the origins of the muscle from the side of the thorax, coming down in thin layers over the ribs. *Secondly*, a stronger and more fleshy part winding round the side betwixt the false ribs and the ilium. Then the expanded tendon on the fore part of the belly divided by the *linea alba*, which is in a direct line from the pubis to the sternum, and the *linea semilunaris* running up from the os pubis in a curved line, a little to one side. In the space included betwixt these two lines, you may observe indistinctly the rectus shining blue and livid, through the transparent tendon of the external oblique muscle, and intersected with white interstices formed by the adhesions of the tendons of the rectus.

Of the umbilicus.—In the course of the dissection, the umbilical opening in the linea alba will be attended to. It is like a perforation in the tendons united to the hard skin which is over the perfo-

ration, there is a dense cellular substance like ligament (the remains of the umbilical vessels) which fills the hole, and on the inside, the peritoneum is dense, and firmly attached to the tendinous ring of the umbilicus.

The inguinal ring.—But the most important part of this first dissection still remains to be described, viz. the anatomy of the ring. When dissecting the lower part of the abdomen near the pubis, you find the fibres of the tendon coming down obliquely to be inserted into the ligament of the thigh. Dissecting still nearer the pubis, just as the tendon is about to be inserted into that bone, you see it splitting, and allowing the spermatic cord to slip through its fibres, and then meeting again, its fibres cross each other, and are at the same time firmly implanted into the crest of the os pubis. This is all that can be observed of this ring in the present stage of the dissection, continuing to dissect the integuments off these parts, and a little down upon the thigh, observe the situation of the femoral artery, of the epigastric branch, of the spermatic cord, and all the parts implicated in the femoral and inguinal hernia. (See further of the anatomy of the femoral ligament, in that part of the work which contains the dissection of the thigh.)

Of the Groin.—In taking off the skin from the groin, you find a confused and irregular aponeurosis coming off from the abdomen, and going down upon the thigh, apparently made up of, or strengthened by, the close intertexture of cellular substance. At this part you find it covering the femoral artery; the inguinal glands lying without it, and the vena saphæna major sinking through it to join the femoral vein. You find also, where the thigh is injected, the small arteries, viz. *inguinales* rising perpendicularly from the great trunk, to supply the glands, and the other superficial parts; you find too the external pudic arteries.

After dissecting and observing the natural texture and situation of this aponeurosis, and the connection it forms between the Poupart ligament and the sheath of vessels, sacrifice it to a more important demonstration, or leave it on one thigh, while you proceed with the dissection of the other. Thus, taking away these confused parts, expose neatly the ligament of the thigh. Dissect the artery and vein in the angle of the groin, where they lie imbedded. Then, dissecting delicately with your scissars, under the ligament, you find proceeding from the upper part of the femoral artery, two branches; the arteria circumflexa ilii, and the epigastric artery. The first of these you find running back along the inside of the ligament, towards the ilium, to inosculate with the ilio-lumbar artery; the latter is the more important, the *epigastric artery*. It runs upon the inside of the tendons of the abdominal muscles, making its way to the rectus muscle, on the inside of which it climbs, even till it inosculate with the internal mamary, (which is the first branch of the subclavian artery.) In this course it crosses the upper part of the ring, and crosses behind the spermatic cord. Now, you observe that the femoral hernia, coming down on the inside of the femoral artery, the epigastric artery and the spermatic cord must pass before the neck of the sac, so as to hinder the free incision of it when strangulated; and you see that you have to cut thread by thread exactly in the middle point betwixt the epigastric artery and the cord.

These are parts of such importance, that you ought to consider them in every possible light. You see that the direction of the inguinal hernia must follow the course of the cord, that it will be nearer to the pubis, and higher up: that the seat of the femoral hernia is in the flexure of the groin; and that if the hernia is not very large, and the parts swelled, the ring, and the cord from the ring to the testicle, should be free. You have to observe how the arch, which is formed by Poupart's ligament, over the vessels and muscles coming from within the belly, is filled up with fat and cellular substance, and how the vessels lie imbedded in it. You find the vein lying more towards the pubis than the artery, and the small inguinal branches of the artery rising to supply the inguinal glands; these arteries sometimes bleed profusely in opening buboes in the groin.

SECOND STAGE OF THE DISSECTION.

Having paid equal attention to the dissection of the muscles of both sides of the belly, you proceed thus: dissect off the serrated origins of the external oblique muscle from the ribs,' and from the space between the ilium and false ribs, and detach it from the obliquus internus which lies below it. You will recollect that the obliquus internus ascends from the ilium, spreading its fan-like fibres in a direction which forms an acute angle with the fibres of the external muscle which you are dissecting off. Continue

to separate the external and internal oblique muscles, till you find them firmly attached by their tendons to the linea semilunaris. Betwixt them there is interposed some loose cellular substance, which mars the beauty of the lower muscle if not carefully dissected away; and you find them connected by the branches of the arteries and veins piercing them to gain the skin and cellular substance. Observe the origins of the OBLIQUUS INTERNUS ABDOMINIS from the spine of the ilium, and apparently also from the mass of muscular and tendinous origins of the muscles of the back (you will find it very difficult to dissect its origins from the spine, as described in books). Those fibres of the muscle which originate from the back part of the spine of the ilium, run directly upwards to the cartilages of the false ribs. From the fore part of the ilium its fibres are continued more in a direction across the belly; and from its lowest portion which runs directly downwards in the direction of the external oblique, you find it sending off, behind the external ring, a delicate fasciculus of fibres which invest the spermatic vessels, and forms the origin of the CREMASTER MUSCLE.

The belly of the internal oblique muscle ends in a uniform edge, and its tendon is finally inserted into the linea semilunaris: but here it is to be remembered, that some anatomists have described its tendon as splitting into two layers, one forming, with the external oblique, the outer part of the sheath of the rectus; the other forming the inner part, with the tendon of the transversalis abdominis.

This inner oblique muscle, when dissected, should be left in its seat, and the outer muscle replaced over it. Then making an incision by the side of the linea alba, which opens the sheath of the rectus, you dissect it back towards the linea semilunaris. In doing this you must separate, carefully, the sheath from the tendinous bars of the rectus muscle, for at these parts they are firmly blended together. Towards the bottom of the sheath, you find the PYRAMIDAL MUSCLE running up from a broad origin upon the os pubis, to an acute point inserted into the linea alba. The two pyramidal muscles rising together, one on each side of the middle abdominal line, form a cone that is sometimes observable, shining through the strong sheath which covers them. These parts being completely dissected, return them to their former place; and having continued the dissection of the muscles of the other side exactly in the same manner, proceed after this method.

The tendon of the internal oblique muscle is to be cut from its connexions with those of the other muscles at the linea semilunaris: then dissect the muscle back towards its origin upon the spine of the ilium; and laying it over the haunch, you have an opportunity of observing the course of the TRANSVERSALIS ABDOMINIS. You find its fibres running across the belly, more in the direction of the external oblique, than in that of the last dissected muscle. You see it arising fleshy, from six of the lower ribs, upon their inside, (which has allowed some anatomists to describe minutely its digitations with the diaphragm); and tendinous, from the mass of muscles upon the loins. It runs a little round towards the side, where the strongest part of the muscle is formed. It arises likewise from the spine of the ilium, and even from the outer part of the ligament of the thigh. It is inserted into the linea alba having previously connected itself with the linea semilunaris. It will be observed, that towards the lower part of the belly, this muscle appears deficient, and the bowels are seen through the peritoneum, the outer surface of which is covered with much confused cellular substance, and unlike its smooth inner surface, which is towards the intestines.

SUBJECTS FOR CONSIDERATION DURING THIS DISSECTION.

It may be observed in the skeleton how great a space there is to be covered from the edge of the thorax to the brim of the pelvis, and backwards to the spine; and recollecting, that in this space are contained the soft viscera of the abdomen, and that these must be sustained by an elastic and yielding covering, it will be understood how this covering, whilst it supports the viscera, and yields to and assists the operation of the diaphragm, must support and poise the whole trunk upon the pelvis; and that although the muscles of which it consists be thin and delicate, yet, having so great a lever as the edge of the thorax, while the centre of motion is at the spine, it bends the upper part of the body with great force. Further,

I. The abdominal muscles are muscles of respiration. 2. They are muscles of the trunk. 3. They compress and sustain the viscera.

II. 1. The student ought to consider how as muscles of respiration, the distinction in the manner of breathing becomes a symptom of disease. 2. How we endeavour to substitute the action of these muscles, and the diaphragm, for the external muscles of respiration, in fracture of the ribs and sternum, &c.

III. 1. The question, are the viscera of the abdomen suffering an unceasing pressure? is a very important one. 2. And when on this subject, we are called upon to consider how the effect of pressure of the abdominal muscles becomes a diagnosis in diseases of the abdomen? 3. The effect of pressure taken off, by the delivery of the child, or by the drawing off of the water in ascites; 4. The distinction of herniæ as they may proceed from weakness in the tendons, or where they are brought down by powerful exertions; 5. The sympathy of these muscles with the bowels; 6. How they are early affected in tetanus, and even lacerated in the violence of the convulsion in this disease.

IV. 1. Collection of matter sometimes form in the interstices of these muscles, or in the cellular membrane on the outside of the peritoneus. 2. The nature of the sinuses which form amongst their layers should be thought of.

The dissector will now comprehend how much more is to be learned, than can be taught by a porter in a dissecting room.

DISSECTION OF THE INGUINAL RINGS AND LIGAMENTS OF THE THIGH.

When the tendon of the *external oblique* muscle is descending to the os pubis, it splits to form an opening for the spermatic cord. On the first stage of the dissection, to examine the opening, let the student attend to the dense layer of cellular membrane which covers it, for this membrane forms one of the coats of hernia, when it takes place here. The fasciculi of fibres, forming the sides of this opening, are called the pillars of the inguinal ring. The form of the opening is that of a very acute angle on the outward and upper end towards the pubis, it is larger and round at their insertion into the os pubis, the columns decussate. I have used the common expression, and have said, that the splitting of the tendons forms the ring; were it so exactly, the action of the muscle would draw tight the opening, and compress the vessels of the cord.

The ligament of the thigh is formed by the tendon of the external oblique muscles of the abdomen taking a firm hold of the spinous process of the ilium, and stretching over the muscles and arteries of the thigh to the os pubis. On the outer part, as it rises from the os ilium, it is firmly tied down by its connexion with the fascia of the thigh. In its whole length, but chiefly as it approaches the pubis, it is not the rounded tendon which, from viewing it on the outside, we should expect; but it is turned in and inserted into the os pubis with a flat broad horizontal tendon. The consequence of this is, that at the point towards which the viscera must gravitate in the erect posture of the body, it is very strongly secured: and that the effort of the viscera to protrude is not made under the arch or ligament, but above it; since the margin of the tendon spreads thus horizontally to be inserted into the pubis.

The spermatic cord lies as if in a groove formed by the ligament as it approaches the os pubis; and as the extremity of the ligament forms the lower pillar of the ring, an exit is, by a peculiar yielding or twirling of its more outward fibres, allowed for the cord, without diminishing the strength of the femoral ligament, which, by its horizontal sheath stretching backwards, is firmly inserted into the bone. Thus the spermatic cord is not exposed to the compression of the two pillars of the ring; for as the lower pillar of the ring is the extremity of the femoral ligament, as from its connexion with the bones it is immoveable by the action of the abdominal muscles, and as this lower pillar holds the cord in a kind of flat groove laid horizontally on the os pubis, its outward fibres only yielding to allow the cord to escape, the consequence is, that the upper pillar (which spreads its fibres on the outside of the lower) does not, when made tense by the abdominal muscles, compress the cord against the lower one.

On the other hand, the security of the abdominal ring depends upon the obliquity of the passage, and upon the pressure of the viscera not being made in the direction of the cord, but laterally.

Now let the dissector make an incision from the *linea alba* two inches above the pubes to the lower spinous process of the os ilium, through the tendon of the external oblique muscle: he has then to dissect down the lower part of the tendon, to observe, the internal apparatus of the spermatic passage. Here he may observe the course of the *internal oblique*, he will find a few fibres of it descending over the cord, to form the cremaster muscle; following the lower edge of the internal oblique muscle, (if the subject be a remarkably strong male,) he may find a small tendinous margin, obliquely crossing the cord, but generally the muscular fibre only is over the cord.

I may now remark, that in the dissection of these natural passages, as in the dissection of hernia, we must feel before we cut, we must gently insinuate the finger amongst the cellular membrane, then we feel what really gives resistance and by cleaning the fat from around it, we may see the guard upon the passage, or the ligament or fascia, which may eventually strangulate.

Upon feeling the vessels of the cord from the margin of the internal oblique and the cremaster muscle, the length of this oblique transit of the spermatic cord is apparent; behind the spermatic cord a bed of fat is seen; behind that, the epigastic artery is found passing across the cord.

When the internal muscle is dissected off the cord, there is behind the mucle a layer of cellular substance, which surrounds the cord, in which the *vas deferens*, and vessels of the testicles, descend under the peritonium and scatter to their destinations: on the inside of the *vas deferens* the epigastric artery and its sheath of cellular membrane will be felt. Here is the internal ring of Mr. Cooper. Instead of this condensed cellular membrane, he describes a fascia having a slit to allow the spermatic vessels to pass. Mr. Cooper says, that this fascia is the guard against hernia, but admits that in some subjects, it appears as condensed cellular membrane only. I have found in operating on inguinal hernia, that the contraction was not in the ring, but in the peritoneal sac, fully two inches within it. When the peritoneum is pushed over the spermatic vessels, by the protrusion of an intestine, it passes under the inner muscles, and around upon the outside of the epigastric artery. The epigastric artery is pushed inward, the cellular membrane accumulated by this yielding, is pressed and condensed: but sometimes it will not allow the further shifting of the neck of the hernial sac inward, and the condensation and thickening of the peritoneum and cellular membrane are such as to form, indeed, a ring, which may strangulate the gut; and I may add, though this is no place to enter more fully into the explanation, the sudden turn which the intestines takes round the artery, is the cause of the strangulation.

When the student has made this dissection of the ring from without, he may take an opportunity of laying down the whole flap of the abdominal paries over the thigh, and examine the ring by lifting the peritoneum from the inner layer of muscles,—here he is to distinguish the fascia, which comes up from the iliacus internus, and lines the abdominal muscles, then tracing the spermatic vessels and the *vas deferens* through this fascia, he has to determine whether or not it be strong enough to account for the strangulation of hernia, whether it deserves the name of fascia, or layer of the cellular membrane.

Of the dissection of the femoral ligament.—Another very curious piece of anatomy must be studied, before we leave the consideration of the abdominal muscles.

The dissector makes incisions upon the integuments of the lower part of the belly and top of the thigh. In taking the skin from the tendon of the external oblique muscle, he has to observe a thin but pretty firm web of cellular membrane. It is very useful to observe this membrane, but not very accurate to call it fascia or aponeurosis. It would be found to cover the ring and spermatic cord, towards the pubis. Towards the outer and upper part of the thigh, it mingles with the *facia lata*, and on the middle of the thigh, it is dissipated and lost in the fat glands and cellular membrane, which lie over the femoral artery and vein. Having dissected the *fascia lata*, which is on the outside of the thigh, and observed the manner in which it mingles with the sheath of the great vessels, and turns in to unite with the femoral ligament, he may open the sheath. In proceeding to dissect away from the groin the glands and fat, we shall find a few delicate superficially distributed nerves coming from under the ligament of the thigh. We shall find also, that the cellular membrane which surrounds the great vessels forms a condensed bed, independently of an aponeurosis upon the subjacent muscles. The inner sur-

face of this cellular membrane is strong from the interlacing of fibres. It covers and invests the great artery and vein. The same condensed cellular membrane is continued behind the vein and artery; and by pulling up these vessels, after dissecting it from before them, the branches may be seen piercing it like the vessels of the heart going out from the pericardium. All the vessels in the body are more or less supported in this manner by sheaths of cellular membrane; but it is at such places as this in the groin that it becomes a great object in surgical anatomy.

The dissector endeavouring to push his finger up into the belly by the inside of the vessels of the thigh, feels the sharp edge of a ligament, and when he pushes his finger deep and again withdraws it, the circular edge of this ligament, can be seen.

In substantiating the explanation of the cause of strangulation, viz. that for the most part, it was not narrowness of the opening under the ligament, but the sudden angle of the gut when forced out from the groin and made to accend on the face of the abdominal tendon; I have had occasion to demonstrate this ligament as causing the sharpness of the angle.

In the internal view of the ligament of the thigh, there is a difference in my manner of demonstrating the connexions of the tendons of the abdominal muscles, which I state with diffidence after the very full investigation of this piece of anatomy by others. In the first appearance of the psoas abscess in the groin, and the tumour of the femoral hernia, there is a striking difference which long since made me endeavour to discover the cause. I have accounted for this from the insertion of the *psoas parvus*, where it was present, and from the attachment of an aponeurosis, which I have observed going off from the psoas magnus, where there was no lesser muscle. The psoas muscle is described as being inserted into the os pubis or the junction of the os ilii and os pubis, and as being a muscle which assists the psoas magnus, my observation has led me to describe the psoas parvus, as a muscle guarding the connexion of the abdominal muscles; and when this muscle is wanting, I have shown the going off of a fascia from the psoas magnus, which connected itself with the inner edge of the ligament of the thigh, so as to close the abdomen, and, as I have alledged, excluded the illiac vessels from the abdominal cavity. Hence, I have explained, that pus descending from the vertebræ, passes on the outside of this fascia or aponeurosis, and by the side of the iliac vessel; but when hernia takes place, it is on the inside of the iliac vessels, because on the inside of this fascia. Further, when I have taken occasion to shew the manner in which the abdominal viscera were enclosed and supported, I have never failed to mention the psoas muscles with the abdominal muscles, the diaphragm, and perineal muscles.

After the dissector has attended to these connections of the psoas muscles, with the abdominal muscles, he ought to dissect and examine the inner edge of the ligament of the thigh, and the termination of the tendon of the rectus.

DISSECTIONS

OF THE VISCERA OF THE ABDOMEN.

FIRST DISSECTION.

Of the Manner of opening the Body, and observing the general Situation of the Viscera.

As the great use of dissection is to acquire the knowledge of the parts in the living body, it is proper, before opening the belly, to read the general description of the parts; to learn the boundaries of the abdomen; the situation of the diaphragm, encroaching upon the cavity of the thorax; the track of the intestines; and the place of the more important viscera;—how the liver and stomach are received within the margin of the ribs, and guarded by them;—how the arch of the colon winds round under these; and how the small intestines are collected in a group under the navel. It is of importance to mark the situation of all these parts, and to conceive which would be wounded by pointed instruments, pushed in various directions. A degree of accuracy in the knowledge of the seat of the viscera will thus be acquired, which is of the greatest use both to the physician and surgeon.

In opening the belly *, a simple crucial incision is made; one cut from the scorbiculus cordis to the pubis, keeping the left side of the navel; and another crossing it from the spine of one ilium to that of the other, coming below the navel. In doing this the only care should be to avoid cutting the intestines, by raising the integuments from the viscera, after the first puncture. Having thus laid open the belly, it will be seen whether the preconceived ideas of the situation of these parts be correct.

In private dissections, when the abdomen and breast are to be opened, one incision from the throat to the pubis will lay open both cavities sufficiently.

The following are the points to be observed, and which will lead, without confusion, to a full demonstration of the whole.

1. The GREAT ARCH OF THE COLON, mounts up from the os ilium of the right side, crosses the belly under the edge of the liver and brim of the thorax, and descending again upon the left side, sinks under the small intestines, and rests upon the wing of the os ilium; thus surrounding the small intestines, which lie together in the middle of the belly.

2. The STOMACH will be found in the left hypochondrium †, retired under the ribs, and covered by the arch of the colon.

3. The OMENTUM will be found proceeding from the stomach and colon, which lie contiguous, and stretching down over the small intestines, a delicate and expanded membrane, loaded with fat.

4. The liver will be seen with its edge under the margin of the ribs, and towards the right side.

* I speak here, as if another body were bestowed on this demonstration; but there is no necessity for it.

† Meaning the space under the cartilages of the ribs.

Such is the general appearance upon the first opening of the abdomen. But as one part of the intestinal canal may happen to be more inflated than another, this regularity will sometimes be disturbed. The stomach may be distended, and the colon contracted and empty; consequently, instead of the colon being the prominent part, it may have subsided, and be scarcely distinguishable from the small intestines, while the stomach may push out its sides from under the liver and the ribs of the left side: or perhaps the stomach and colon may have both receded, by the expansion of the smaller intestines. Now, in this state of the intestines, if an attempt be made to unravel them with the hands, there is every probability that they will be tumbled into greater confusion and disorder. It should be remembered, that in the examination of all these parts, the colon is the sure guide; for the caput coli is fixed down by the peritoneum to the loins, upon the right side; and from this the colon can be always traced up under the stomach, and above the small intestines. This transverse portion is called the arch of the colon, and if you puncture it, and introduce a small blow-pipe, and blow it up, then every thing seems to take its true place. As the colon swells up, it shows its ligamentous bands, and the cells so peculiar to it. It is seen rising before the stomach, descending upon the left side, and under the small intestines, and finally tied down by the peritoneum to the loins upon the left side, forming at this place the sigmoid flexure of the colon, which is the last portion of this gut. From this point to the anus, the continuation of the intestine is the RECTUM.

In this first display of the viscera, there is a very partial view of the intestines: only a part of the colon, jejunum, and ilium is seen; and to trace the whole length of the alimentary canal, this natural appearance must be deranged.

COURSE OF THE INTESTINES.—Having found the great curvature of the stomach, and the arch of the colon connected by the omentum, separate them, by detaching the omentum from its connexion with the colon, and lay the great intestine down over the small intestines. You then find the stomach lying obliquely across the upper part of the belly, towards the left side, a conical bag, bent upon itself; so that the two ends approach, forming on the under side a greater and on the upper side a lesser curvature. The greater curvature presents itself in this view of the parts. The cardiac orifice, or entrance of the œsophagus lies out of sight; and even the pylorus, the lower orifice, recedes out of sight when the stomach is distended. Towards the left side, under the ribs, and hanging on the great curvature of the stomach, you find the SPLEEN of a dark and livid red colour. You see the DUODENUM, the first intestine, taking a turn upwards from the pylorus, stretching a little to the right side, then turning upon itself, and descending under the mesocolon towards the right kidney. Observe how it is bound down at this point; observe also its situation with regard to the stomach and liver, and arch of the colon; and remember that it is here within this space that it receives the pancreatic and gall ducts, and from its size and the circumstance of these secretions being poured in here, this has been called *ventriculus secundus*. Neither of the ducts can be seen in this stage of the dissection, the pancreas itself being obscured in the cellular substance at the root of the mesocolon, but you may feel it under the stomach, a hard conglomerated mass, stretching directly across the spine. The extent of the duodenum is from the orifice of the stomach to the place where the gut emerges from under the mesocolon. It lies before the emulgent vessels, before the aorta, and upon the last vertebra of the back. It is larger than any of the other small intestines, and sometimes is very greatly distended.

Turning up the colon and omentum, fixing them over the brim of the thorax, and pushing down the small intestines towards the pelvis, you find the duodenum coming out from under the colon, but still tied close to the spine by the peritoneum, or lining membrane of the abdomen. After a little space, the intestine extricating itself from the ligamentous folds of the peritoneum, is seen rising up and coming forward, and is called the JEJUNUM.

You have now to unravel the small intestines, which lie below the arch of the colon, as they at first present themselves to you. The small intestines are the duodenum (which you have already examined,) the jejunum, and the ileon. These two last comprehend the whole length of the small intestines below the mesocolon, the lower end of the ilium terminating in the caput coli, or beginning of the great intestines.

The JEJUNUM, is so called from being found more empty than the ileon; but this must not be trusted to. It is said also, that it is of a redder colour, and more vascular and more abounding in the valvular

processes of its inner coat; but this distinction may be rejected with safety, as authorized by Mr. Haller. In prescribing the limits of these two intestines, anatomists are reduced to the necessity of supposing them to be divided into five parts; two of which they give to the jejunum, and three to the ileon; which, showing the necessity of an arbitrary division, is thereby decisive of its inutility. It is sufficient to observe, that these small intestines may be pretty regularly divided into two masses, especially when inflated; that the upper portion, and that more to the left is the jejunum, while the lower is the ileon; and that the situation of this last exposes it more to hernia, especially on the right side. Very generally the portion strangulated in hernia of the right side, is about a foot distant from the caput coli. Where the ileon enters the caput coli, there is a soft pendulous projection of the inner coat, forming a valve at the termination of the ileon. When the caput coli is inflated and dried, this valve appears like two transverse membranes standing obliquely across the intestine, the one projecting over the edge of the other; matter endeavouring to pass from the large intestines into the ileon, shuts the transverse slit.

The GREAT INTESTINES form the last division of the intestinal canal. Tracing the intestines according to the course of the food, the first turns, or the convolutions of the portions nearest to the pylorus, are situated farther down in the belly than the last turns of the intestines; and these you find even lying contiguous to the stomach, as the great arch of the colon. The great intestines differ in their functions and use from the others, and seem to be the receptacle of the matter which has already run through the more active small intestines. They form few convolutions; but being very capacious, although short, they fill a great space in the belly. They are commonly divided into the CŒCUM, COLON, and RECTUM; but it is surely better to divide them into the colon and rectum, and to subdivide the colon, as consisting of parts having a variety of shapes, and very different in their situation, into these three portions: First, the CAPUT COLI where the colon is tied down to the loins of the right side, comprehending the valve of the ilium, the cœcum, or properly, the beginning of the colon, and the appendicula vermiformis; all which lie in the space under the right kidney, and in the natural situation of the parts, hid by the convolutions of the intestinum ilion. Observe then upon the outer side of the cœcum a little appendage like a twisted earth-worm, and thence called *appendicula vermiformis*. Secondly, from the caput coli, you trace the colon, mounting upwards over the face of the kidney, and connected with it by cellular substance. A little further up, you find it tinged with the bile (shewing that it has lain contiguous to the gall bladder,) and then going across the upper part of the belly, forming the great arch of the colon. In this part, and its whole course, you will observe its peculiar shape, notched into cells by the ligaments of the colon; which running in the length of the gut, slip their fibres into the interstices of these cells, and seem to form them by constricting the gut. Thirdly, the colon then descends upon the left side, and going backwards under the stomach and spleen, into the left hypochondrium, and then descending over the kidney of this side, it is connected with it, and is again tied down, but less perfectly than on the right side, forming some remarkable turns out of the general direction, and this part is called from the SIGMOID FLEXURE of the COLON. The last division of the intestinal canal is the RECTUM. Drawing aside the intestines, which rest in the hollow of the pelvis, you find the great gut continued down from these convolutions directly, (as its name would imply) to the anus, before the sacrum, and inclining to the incurvation of that bone.

The LIVER.—Replacing the intestines, you have to observe the situation and general figure of the liver. You find the upper surface convex, answering to the concavity of the diapraghm. The under surface is irregularly concave, answering to the parts contiguous to it. It is thick backwards, and on the fore part its thin edge lies over the stomach. Its ligaments rather connect it with the neighbouring parts than support it: and these connexions are disposed so as not to interrupt its gentle motion in respiration, but tie it to the diaphragm, the moving part.

The PERITONEUM is a subject which ought to be studied in this the natural situation of the bowels. The knowledge of this membrane must include much of the general anatomy of the abdomen. It has been invariably the custom of anatomists to pay great attention to the course of membranes, not only in the belly and breast, but in the more delicate organs, and to trace them in all their windings, deriving one inflection or process from another. But one may easily conceive all the investing membranes or surfaces of the viscera and muscles, and of all the variety of parts contained in the belly, were formed at the same time. And here in the abdomen all the surfaces of the intestines of the liver, of the parietes

of the belly, or inner surface of the abdominal muscles, have one common nature. They are all smooth, polished, and continually exuding a serous fluid, which allows one part to glide easily upon another, and to lie in contact without adhering. And as the contents of the belly, though all within one common cavity, do not lie loose, but are attached, the whole surface must be continuous. Now every part of the body, as it differs in structure or use from that to which it is contiguous, is separated from it by a substance differing somewhat from both, viz. the cellular texture. This substance is elastic, dividing one vessel from another, and one muscle from another; without which there would be no action allowed in vessels, nor motion in muscles and their tendons; but the whole body would remain a solid and inactive mass. We find in the belly (as in the stomach and intestines, and in the bladder) one layer of membranes separated from another, where they differ in structure and economy, but the outer layer or surface of all the contained parts in the belly has a common nature, which differs in its properties from the parts which it covers, whether the muscles of the abdomen or intestines, it is separated from them by interstitious cellular substance, and appears, upon careful dissection, a distinct membrane, viz. the peritoneum. If this is to be considered in the light of a separate membrane, involving all the bowels in its doublings, then its demonstration is to be followed in this manner: it is seen lining the abdominal muscles which have been laid back, it can be traced from the lower flap over the os pubis, reflected over the bladder, and again running down betwixt the bladder and rectum, then embracing the rectum, and connecting it to the spine, and while it gives easy access to its blood vessels, involving them in its duplicature. When you put down your hand behind the bladder, you find that you can proceed but a little way; your finger is impeded by the membrane being reflected from the bladder upwards over the rectum, thus separating the viscera of the abdomen from the pelvis. There is no cavity, as it is called in the pelvis, but the parts are connected by loose cellular membrane, and it is the motion of the abdominal viscera which requires the general smooth and investing membrane. In the upper part of the abdomen, the peritoneum is seen in the same manner, continued from the muscle over the inside of the ribs, and under surface of the diaphragm; reflected from the diaphragm upon the liver: and forming the broad or middle ligament *(ligamentum suspensiorum,)* which reaches down from the walls of the abdomen, and is inserted into the upper surface of the liver, in a line with the great fissure which is on the lower surface. You may observe in the edge of this broad ligament, a hard round ligament, better felt by the fingers than seen; it proceeds from the umbilicus, and is the remains of the great *umbilical vein,* which in the fœtus came from the placenta. Drawing aside the colon and small intestines of the right side, to have a view of the right lobe of the liver lying deep in the hypochondrium, you may see the lateral ligament of this side, thin but ligamentous, and formed like the others by the peritoneum reflected from the surface of the diaphragm. And when you look up under the diaphragm, holding down the liver, you see an extensive attachment betwixt them, formed by the peritoneum, which, including a circular portion of the liver, is called the coronary ligament of the liver.

It cannot be conceived that these ligaments support the weight of the liver, they are in themselves delicate, and all the ligaments and processes of the peritoneum in the belly, partaking of the nature of the peritoneum, are gradually elongated upon the slightest extension. But were they in every respect calculated to support the liver, their insertion into its soft substance would be unable to bear its weight; it is the equable pressure of the abdominal muscle that supports it, and all the viscera of the belly.

The MESENTERY, MESOCOLON, and LIGAMENTS of the COLON are formed thus: the lining membrane of the inside of the belly, when it comes to the spine, mounts over and covers all the parts that lie contiguous to the spine; investing them on the fore part, but leaving them at their attachment to the back, involved in cellular membrane. In this manner are situated the kidneys, the great vessels, the thoracic duct, &c. These may be considered as without the peritoneum. But indeed all the contents of the abdomen may be considered as equally without the peritoneum, for they lie as if they had forced themselves forward from the connexion with the back, carrying the peritoneum before them. The intestines are in this situation; the peritoneum coming off from the back bone and loins, on either side of the vessels which go to supply the intestines, includes the vessels in a double membrane, the mesentery, which when it reaches the intestines, separates again, and stretching over the gut, forms its outer

or peritoneal coat. In the same manner is formed the mesocolon of the great intestine, answering the purpose of the mesentery of the small intestines.

Yet this method of explaining, although in a certain degree it may give a clear and precise idea of these parts, may be carried too far, and become intricate. The OMENTUM, that delicate, and in many instances, pellucid membrane, loaded with much fat, which first presents itself on opening the body, is described by anatomists as consisting of four layers; for being a double membrane (which can be demonstrated by blowing it up,) and each of the membranes being formed by the peritoneum coming off in a double layer, the one from the stomach, and the other from the arch of the colon, they thus reckon it, as consisting in all of four layers of membrane. From its connexions, this the great omentum has received the name of the *gastro-colic omentum*. Its connections and double layers are best demonstrated by introducing a large blow-pipe under the great vessels going to the liver, pointing it towards the left side, and blowing it up. It may be traced on the left side to the spleen, which it connects with the obtuse end of the stomach running round to the œsophagus, and being continued even into the lesser omentum. This *lesser omentum* is found by laying down the stomach, and exposing the under surface of the liver. It is a membrane of the same nature with the last; running back from the lesser curve of the stomach, reaching from the cardiac to the pyloric orifice, and spreading backwards to the liver. It forms thus a web, concealing the little lobe of the liver and the pancreas. In injecting the stomach, this membrane ought to be carefully preserved, as it is supplied with arteries from the coronary arteries of the stomach. There is yet another division of the omentum, the *omentum colicum*, which is continuous with the great omentum, arising from the right side of the colon, and and ending conically above the cœcum. The smaller masses of fat which are attached to the great intestines are the *appendices epyploicæ*..

I.

EFFECTS OF DISEASE IN DERANGING THE ABDOMINAL VISCERA.

On this subject it is of importance to study the nature of inflammation, of adhesions, and suppuration, and the almost uniform consequence of disease upon the peritoneum. It will be easy, when this knowledge is acquired, to unravel the diseased viscera, which, without it, must appear confused and intricate.

Active inflammation should be distinguished from turgidity of the vessels; for often a fulness of the veins mechanically produced, is described as an active inflammation in the brain and in the chest, and still oftener in the abdomen. In dropsy, in violent distension of the intestines, in tympanitis intestinalis, and after child-bearing, the veins of the intestines and peritoneum are often found distended with blood. But in real inflammation, there is a suffused redness, the peritoneum becomes thickened, pulpy, and less transparent, and the blood is also of a brighter red colour.

As the eye becomes dry and painful and inflamed when the eye-lids are forcibly kept open and prevented from spreading the secretion upon its surface; so, when the enveloping membrane of the viscera is exposed, the natural secretion of its surface is destroyed, and the surface is irritated and inflamed. Or, by inflammation from any other cause, the secretion is destroyed; the parts lying in contact are no longer kept separate; the secretion is changed into a deposition of coagulable lymph, and they unite.

Adhesion is produced in the peritoneum and intestines in a wonderfully short time: and the smooth membrane, when it is torn from its new connexions, appears cellular; or upon being cut, thickened and solid; or if the surface have undergone severe inflammation (without being allowed to form these adhesions which are so frequently the consequence of inflamed peritoneum,) its surface becomes ragged, and numerous floculi of new membranes are formed upon it. When the inflammation has been violent as in strangulated hernia, purulent matter is sometimes found lying on the surface of the intestines. In long continued chronic inflammation, the peritoneum is covered with opaque white bodies.

In diseases where inflammation has spread among the viscera, it is generally understood that the peritoneum is the original seat of the inflammation. And according to this idea, it appears upon dissection, that the intestines do more readily than the muscles participate in the inflammation of the peritoneum. The muscles are indeed guarded in some measure by the loose cellular substance, which

separates them from the peritoneum. But this does not satisfactorily account for what in the above view appears to be so great a difference between the sympathy of the intestines and that of the muscles with the peritoneum. The true explanation seems to be, that the disease or inflammation is in general communicated, not from the peritoneum to the intestines, but from the intestines to the peritoneum. It is the disease of the intestines which produces those deadly symptoms that are said to mark inflammation of the abdominal cavity. However, there are diseases in which the peritoneum is peculiarly the seat of inflammation, and this inflammation of the peritoneum, produced by any external cause, is dangerous by propagating its inflammation to the bowels, or from the great extent of the cavity, the interminable surface, as it were, along which the inflammatory action is propagated.

II.

DISEASE IN THE OMENTUM.

Under the title of *omentum extra sedem,* there is no end to the varieties to be described; but this is the explanation. It is a membrane in its natural state loose and floating, reaching into the furthest corners of the abdominal cavity; and if there be in any part an inflammatory tendency, this membrane is prone to assimilate with the action and to adhere. Thus if there be disease about the pylorus, there the omentum is collected and massed into a tumour; if there be obstruction of the colon, the omentum forms tumour there; if there be disease in the womb, though seated deep in the pelvis, this membrane will have formed an attachment to the fundus of the uterus; if there be a hernia it is more than an equal chance that the omentum forms a part of it. From this disposition to attach itself and to assimilate with disease it is of all the parts in the abdomen, the least frequently to be found in the natural state. We find it inflamed, gangrenous, morbidly loaded with fat, wasted as by putrefaction, schirrous, steatomatous, entangled with hydatids, and its cavity distended with fluid.

III.

OF THE DISEASED APPEARANCES OF THE STOMACH.

. The stomach and spleen being minutely injected with size, they are to be taken out and carefully examined. Notwithstanding the very peculiar and important office of the stomach, in performing the first change in the assimilation of the food, yet no complicated apparatus appears; it is a membraneous bag similar to the other parts of the canal. 1. The distinctions of the great and lesser extremities are naturally dwelt upon. 2. The attachment to the former to the spleen by the *vasa brevia,* is noted as demonstrating this to be the place of the most important function. 3. The muscular coat of the stomach will of course be traced from the œsophagus, and the motion of the stomach considered in digestion; in rumination, in the borborygmus, its sympathy with the diaphragm in vomiting, &c. 4. Then the other coats will fall to be dissected, the seat of inflammation considered, as, for example, how it may be confined to the villous coat, or be evident also in the vascular coat. 5. If the dissector ever means to consider himself as entitled to speak before a jury, he will be led to consider the distinction of ulceration of the inner coat of the stomach from poison, and that destruction and softness the effect of its own juices. During life, the property of life in the coats of the stomach, prevents the action of the gastric juice, but if a person be suddenly cut off during health when gastric juice has been secreted, nothing prevents this secretion, intended for the food, acting on the stomach. 6. He will think of this necessary effect of acrid matter acting on the living stomach, viz. that there will be vascular action excited, and inflammation or extravasated blood around the spots, which is intirely wanting in the former case. Thus, I have seen death from swallowing caustic alkali, where with the blackness of the inner surface, the substance of the stomach was much thickened; in poison of concentrated acid there is the same appearance. In those dying from swallowing an inordinate quantity by spirit, I have found the inflammation, attended with remarkable spots of extravasation in the coats. In consequence of the poison of arsenic, with the erosion, there is much redness from inflammation and extravasated blood. 7. In hydrophobia, from the bite of a rabid animal, I have found large spots of an inflammation like erysipelas about the cardiac orifice. 8. In cancer of the stomach, there is sometimes an appearance of

glandular thickening of the walls of the stomach with ulceration on the inside; it is sometimes like soft cartilage on the inside; or there is a fungus or cancerous tumour, hanging into its cavity from the coats of the stomach. 9. I have also met with that very peculiar ulceration of the stomach, which leaves an opening in its side as by the thrust of a sword, and by which the contents of the stomach escape. When this has been the case, I have found the matter which has escaped, confined to the upper part of the belly by the adhesion of the colon to the margin of the chest. 10. Distinct schirrous tumours are occasionally formed in the coats of the stomach. 11. Schirrous thickening of the pylorus, I have often seen, but not a proper stricture, though it sometimes occurs. 12. The distention or the contraction of the stomach though great in a degree, we are not to consider as organic disease.

In examining the body, it will be observed how the stomach and spleen may be wounded by a thrust apparently into the thorax; or how the lungs and stomach, or lungs and liver, may be thrust through at once. It may also be observed, how the stomach and liver lie before the diaphragm, where it goes obliquely down upon the back part of the abdomen; and how they lie contiguous to one another. The effect of hydrothorax, in pushing down the diaphragm, and depressing these parts—the effect of empyena too in causing the liver to protrude, and the effect also of enlargement of the liver, or distention of the stomach, upon the breathing, must all be obvious.

The stomach is commonly retired behind the colon, and under the ribs. Yet, when slightly distended, it comes further down in the belly, and assumes the place of the arch of the colon. Therefore finding a patient with an open ulcer immediately under the scorbiculis cordis, discharging the contents of the intestines (several cases of which I have seen,) it may be questioned whether it be an opening from the stomach or from the colon. This is determined by observing the matter discharged, whether it be food partly digested, as from the stomach; or fæces, as from the colon, after having gone through the whole length of the canal. Or in such a case, we should have occasion to note, the sharper pain followed by inclination to go to stool, which marks the disease of the lower parts of the canal, or the pain more sickening and subduing, which marks the disease of a higher part of the canal.

OF DISEASES OF THE LIVER, DUCTS, &c.

Varieties of tubercles, are occasionally seen in the liver, as the more common brown tubercle, the large white tubercle, the soft brown tubercle, and the scrophulous tubercle. The liver is sometimes found very hard and dense with its edge turned out, this is believed to be the first stage of the disease producing tubercle. I have observed a jaundice, attended with a universal sponginess and thickening of the ducts in their course through the liver. The liver is the most frequent seat of hydatids; half immersed in the substance we discover a white sac, which when open, there drops out the proper hydatid, which lay unattached within the sac. The hydatid consists of a soft somewhat transparent laminated membrane, the fluid it contains is coagulable. The general opinion is, that these hydatids are animals, and have a power of generation; we may at one time see the coats studded with little grains; or the young hydatids hang upon the inner side of the sac; or they swim loose in the fluid of the sac. Again, I have seen them, where I supposed the original sac had burst and scattered them among the viscera of the belly to form new adhesions. There seems to be considerable varieties in the hydatids of different viscera, and different animals. I have imagined there preceded in their formation, some peculiar state or kind of action in the vascular system of the part. Hydatids have been found in coagulated blood; I have found them in the fungous bloody tumour. I have seen distinct vesicles, formed by the inflammation following a bruise, that much resembled the proper hydatid. But in any view, we take of them, we have difficulty in concluding on their cause and nature.

Observe the situation of the liver towards the right side; how far it comes down in the right hypochondrium; and how dangerous and improper it consequently is to tap on this side, the more especially as the liver is often enlarged in dropsy. Observe, again, the close connexion of the liver with the diaphragm, and how abscesses originally formed in the liver, may, by the spreading of the inflammation, and by the adhesions with the diaphragm, communicate the suppuration to the lungs, so that the matter from the liver may be coughed up from the breast; or how hydatids originally formed in the liver, may, by the same communication, be coughed up from the lungs; or how matter in the liver, may by its natural tendency to the surface, propagate the inflammation to the abdominal muscles, and,

by forming adhesions with them, be discharged outwardly. In this last case the adhesions, preceding the formation and progress of matter outwardly, the attachment of the liver and integuments is close and intimate, and the abscess points regularly, so that the operation is very easy, yet when in a mature abscess it bursts from exertion, it is apt to spread wide in the cavity of the abdomen. From the contiguity of the colon, the abscess of the liver, besides being attended with a peculiar painful feeling in the right hypochondrium, is accompanied with a sharp pain of the shoulder on the same side; it sometimes happens, that the liver is like the kidney, so little sensible, that, upon dissection, there are found great abscesses where the patient during life, had no complaint. There are, in the writers upon the diseases of hot climates, some strange examples of the extensive communications of these abscesses.

After having observed the intimate connexion of the liver, duodenum and stomach, it is easy to conceive a case by no means singular, a discharge of matter into the stomach and intestines, and even a discharge of the food by the external wound, after an operation for abscess of the liver; for it has happened, that the abscess of the liver has formed a connexion, with the stomach on the one hand, and on the other, has opened outwardly upon the side of the belly. It will be seen, how hydatids getting entangled with the intestines, may be discharged by stool! and how tumours of the liver, pancreas and spleen, must oppress the stomach.

With regard to the operations for the collections of matter in the liver, unfortunate mistakes have been made. There is a case mentioned by Haller, of what he calls a spurious aneurism, in which upon the tenth rib below the scapula, and in the muscular flesh of the back, there seemed to be the pointing of an abscess, which yielded to the fingers; the patient having at the same time a slow fever, and a jaundiced complexion. They had no doubt of its being an abscess of the liver; but the patient died of violent hæmorrhagy the night following the operation. There is another case which brings home to us still more forcibly the importance of an accurate knowledge of these parts, and of a lively conception of the effects of disease upon them. In l'Hopital de la Charité in Paris, the operation for empyena was performed, but no matter flowed from the incision. The surgeon had been deceived chiefly by the circumstance of matter being spit up from the lungs. Upon dissection, they found that the matter had been originally formed in the liver, and from it had been communicated to the lungs! but that this communication, having been formed deep in these viscera, no matter could flow from the incision. In Ruysch there is another case of a country surgeon cutting into the liver, when intending to perform for the paracentesis of the thorax; and the case shows, at the same time, the possibility of mistaking enlargement of the liver with hydatids for hydrothorax. The reason of this should be attended to. When matter first distends the side of the chest, the diaphragm and liver are pushed low, but when the purulent matter finds its way into the bronchiæ, and is discharged by expectoration, the diaphragm rises and the liver follows it, and as the diaphragm rises higher in the chest, it forms adhesion to the pleura costalis. Thus it happens, that the surgeon puncturing for the empyena at the point of election cuts into the liver.

IV.

THE DISEASES IN THE GALL-BLADDER AND DUCTS.

1. Adhesion of the gall-bladder to the duodenum, stomach, or colon, is a very frequent occurrence. 2. The coats of it are found thickened and hard, or it is contracted and altogether obliterated. 3. The quantity of BILE contained in this receptacle varies much even in those suddenly killed, because the discharge or accumulation of the bile, depends upon the circumstance of the food having passed the duodenum, or being yet retained in the stomach. Where there has been much irregular excitement of the bowels, as in children dying of bowel complaints, the gall-bladder is found with much bile accumulated in it. The bile is naturally of a dark yellow colour, and viscid, it may be of a green colour, without absolutely indicating disease. 4. Gall-stones are very common, especially we find a number of small dark-coloured irregular concretions in the gall-bladder; sometimes there is a large solitary gall-stone, and then it is rounded and tuberculated. The colour of the concretion varies like the

colour of bile through the gradation of black, brown, and yellow. 5. The presence of gall-stones in the gall-bladder occasions a spasmodic pain, but often the concretions lie without exciting the violent contractions of the gall-bladder; but if they descend from the cystic duct into the common duct, then they obstruct the bile: then the bile is accumulated in the gall bladder and ducts, and there is great pain and writhing of the body, sickness and pain at stomach (from the distended biliary passages) and general languor, and jaundice shortly after from the absorption of the bile. 6. Stones have been cut from the gall-bladder.—How are we to understand this? that the gall-bladder, has been greatly distended, its fundus has come in contact with the abdominal walls, adhesion and ulceration have taken place, and the stone has been picked out.

We are little acquainted with the DISEASES of the PANCREAS, scirrhous hardening of the gland, though rare, is the most frequent disease of it. Abcesses may be found in it and calculi; we cannot ascertain the presence of disease here, unless when the disease has closed the mouth of the biliary ducts.

V.

OF THE DUODENUM.

1. Its precise situations should be observed, the entrance of the ducts, its size, its function. 2. We foresee that from the mixing of the fluids here, that complaints and uneasy feelings must be very apt to occur. 3. The flatulent distention too, and great spasmodic pain in the back which it occasions may be understood from the manner in which this intestine is confined and tied down. 4. We hold in recollection the sympathy that connects the stomach and duodenum, and liver. Thus, in the continued operation of an emetic, the bile at last appears in the stomach, though not originally there.

VI.

OF THE SMALL INTESTINES AND THEIR DISEASES.

1. As the student must have read of the lacteals and of absorption, he naturally seeks for a portion of the intestine on which the lacteals may be distinguished and injected; he examines the course of the canal, he looks for a faint white line running for about two inches in the length of the intestine, which then making a turn, runs on the mesentry. Having chosen a part of the intestine on which these vessels are most numerous, he has the arteries and veins injected with deep-coloured wax injection, (as of red, green, or black) and then proceeds to inject the lacteals with quicksilver. Other portions of the intestines ought to be most minutely injected with red size in the dissection of the coats, for demonstration; the peritoneum where it forms the mesentry, is to be split up, and dissected in part off, the gut. 2. The muscular coat is best shown by distending the intestine and pulling off the peritoneum in shreds, and by tearing off peritoneum, we have the circular fibres very distinctly visible on the inner surface of the membrane. 3. To show the cellular coat, let the mesentry be cut short, and the intestine inverted and blown up; by this means the air gets access to the cellular texture and distends the inner coat; the intestine may be thus dried, and sections made of it. 4. To show the *valvulæ conniventes* and *villi* of the inner coat, the intestine has only to be inverted and hung in water.

VII.

During these operations, various subjects of inquiry will enter into the anatomist's mind. The nature of the peristaltic motion of the intestines in their natural function; the antiperistaltic motion excited by obstruction or too powerful or unnatural stimulus. 1. From the acquaintance with the muscular action of the hollow viscera, we come to understand the distinction of inflammatory and spasmodic pain, and the distinction of inflammation in muscular, and in solid parts.—For example, if the pain rises in paroxysms and is not fixed, it is an intestinal pain; if pressure and varying the posture relieve it, it is a spasmodic pain of the intestines; but if the pain be constant and fixed, and increased on pressure, the probability is, that it is not a disease of a muscular part, that it is not a spasm but an inflammation. 2. From the consideration of this subject, we see that most terrible of all complaints,

having from the severity of the patient's suffering, been called the *iliac passion,* or the *miserere mei,* proceeds from the muscular contractions of a part inflamed. 3. We comprehend too, how it is possible for parts h ving no muscularity, as the liver, the spleen and kidney, to be inflamed and to pass to suppuration and almost to the total destruction of the substance, while yet the patient suffers little; such appearance of ravaging disease, is not uncommon in dissection, though during life the patient had no complaint in the region diseased. 4. The attention is naturally directed to the experiments, which have shown that mere irritation of the intestine will produce that very strange effect, the introsusceptio, invaginatio, or intussusceptio. This gliding of a portion of the intestine within another, I have often seen in children who have died with irritable bowels. With them, it is not attended with inflammation. There is no adhesion and the invaginated intestine can be easily drawn out again. 5. In the introsusceptio, which I have seen in the adult, it has become an inflammatory disease. These are the appearances; on opening the body, all the intestines which are above the intussusception are greatly distended and inflamed, being of a brownish red colour, and if the inflammation has continued long, purulent matter is mixed with serum in the belly. When we lay aside the distended bowels, we find a knot of intestines. What may be called the vaginal portion of the intestine, is of a pale yellow with black spots upon it, and the tract of the canal below the obstruction is pale compared with the portion above. When the included portion is exposed, it has no resemblance to the natural appearance of intestine; the accumulation is such as to make a total obstruction in the canal, it is gangrened and perfectly black. This is a subject which would admit of a long inquiry. I will only venture to say, that Mr. Hunter, in writing his paper on this subject, has mistaken the pathological principle, and that the practice which he recommends is eminently dangerous, 6. The intestines may be obstructed in many ways by adhesions and entanglement of the convolutions; they may be strangulated by adhesions of the omentum around them, for then it gets to be of a tendinous firmness, by schirrous contractions, by calculus within the gut, by all the varieties of hernia; and in all these cases much the same train of symptoms and the same morbid appearances are found. 7. The racking pain in inflammation of the belly, is not an idiopathic symptom of inflammation of the peritoneum, but of the action and tormina of the bowels, when excited in such a state of the parts; while often in fatal inflammation, as after lithotomy, or wounds of the viscera, there is no excruciating pain, but tenseness of the belly, faintness and languor.

In dissecting herniæ, where the inflammation of the abdominal viscera has been violent and suddenly produced, I have repeatedly found the small intestines connected more or less with one another, not only in the groin, where the strangulated gut adhered, but through the whole extent of the abdomen. But the peritoneum, which lines the abdominal muscles, I never saw connected with the intestines in this disease, unless at the part where the gut was confined in the rupture. This inflammation and adhesion of the intestines extending through the whole belly, while the general investing peritoneal membrane adheres only at the ring of the hernia, shows at the same time, that inflammation is propagated, not by the peculiar nature of the peritoneum, but by the sympathy among the intestines themselves or rather as I have explained by the excitement of the accumulated contents.—What follows relate to the vascular structure of the intestine.

VIII.

1. In inflammation of the intestines where the obstruction has proceeded from the inflammatory state, the colour is of a brighter red. 2. Where inflammation has followed obstruction, and the working of the coats on their accumulated contents, it is rather of a dark red, or brownish red; in both cases when the inflammation approaches to a gangrene, there is a dark livid red with patches absolutely black where gangrene has taken place. Once only have I found the intestines and omentum black as soot: there was not the slightest tinge of blood nor any appearance of inflammatory action. 3. The inflammation sometimes produces flocculent membranes hanging on the surfaces of the intestines; and I have seen white spots on the intestine, but they were not pustules. Abcesses form too, but I have only seen them in the mesentery. 4. Dysentery has its seat in the great intestines, chiefly. The appearance is

quite peculiar. The colour of the diseased portion is dark and motly. The vessels are very turgid but the blood is not in the vessels only but effused parts of the intestines are quite black, they are not distended. The coats are thickened, and where they are most so they will be found ulcerated within. Irregular tubercles are sometimes in the inner surface. Masses of coagulable lymph I have found on the surface of the great intestines when highly inflamed. 5. We find from time to time a portion of the canal callous or scirrhous; this is a disease principally of the great intestines or of the orifices of the stomach, or the termination of the ilion, it is most of all frequent in the rectum. 6. Adhesions formed among the intestines, may sometimes be obliterated again, if the violence of the first stage do not prove fatal. In the dissection of a man who died after the operation for hernia, and where the inflammation had been very extensive, all the small intestines were found glued together in one or two separate masses; and those, when cut out, and a section made of them, looked like large honey-combs. Very much the same appearance occurred in another case, where the violence used to reduce the hernia without incision, was so great as to occasion mortification of the gut after it had been reduced. In other cases, where the inflammation had likewise been very great, the patient suffering long, and at last dying after the inflammation had subsided, I have found (which indeed is often met with), bridles connecting the small intestines, like the chordæ tendinæ of the heart, an inch and a half in length, slender and crossing over an intermediate convolution of the intestine, and holding it thus, as if in a noose, in imminent danger of strangulation, and in several cases since, I have seen the intestine thus strangulated. Now these strings must once have been adhesions formed by inflammation, and were probably broad and extensive at first, though now stretched out to this shape by the natural contraction of the intestines.

IX.

1. Where the arch of the colon crosses the belly, it lies contiguous to the stomach: and here, communications are sometimes formed by disease. As already hinted, there is some difficulty in examining such cases, for there is much confusion often, and massing together of the parts by inflammation. For example, the peritoneum, stomach, duodenum, colon, gall-bladder, and liver, are all grown together into one confused mass, shooting fibres out on all sides, and degenerating on the surface into a thick soft matter, by which all these parts seemed to be glued together. In such a case I have found an ulcer forming a passage from the stomach into the colon, which was empty; and the stomach was disfigured all round the ulcer, by irregular scirrhous tumours and abcesses." This I give to remind the dissector of the confusion which attends almost every organic disease in the viscera.

2. From the shape of the great intestines, and from their size and greater inactivity, it may be conceived how peculiarly liable they are to congestions, and the formation of balls and concretions. These accidents are peculiarly incident to the caput coli upon the right loin, and the sigmoid flexure of the colon on the left; and we find, in books of cases, more frequent instances of congestions in these parts than in any other part of the canal. These concretions are sometimes formed into balls of amazing size, and the intestine, contracting round, embraces them closely. They are attended with great suffering, and continued colic pains, and partial inflations of the intestines; with tenesmus and gradual exhaustion of the body. It has happened, that such balls of immense size have been disengaged from their original seat, and have appeared at the anus, and been extracted, like the child's head with forceps. They are generally formed upon some nucleus of indigestible matter that has been swallowed, as stones of fruit, bones, &c.

3. According to the importance of the function which any part has to perform, the derangement of its action is dangerous to the constitution, and painful and distressing; there is no better proof of the danger and bad consequences likely to be produced by the inflammation of a part, than the pain and general effect which it has upon the economy. In the great intestines, the pain is sharp and rousing; in the stomach and small intestines more heavy, and more oppressive and sickening.

4. Cases delivered as being the tympanitis abdominalis, often admit of dispute. Without denying the fact of air puffing up the belly, and being contained without the intestines, or in what is called the cavity of the abdomen, it may be observed, that this can happen only immediately before death—perhaps from gangrene of the intestines, and the consequent escaping of air from them. But the accumulation of air found in the abdomen on dissection is oftener generated by putrefaction after death; as in cases of gangrene of the intestines from hernia, in mortification after wounds, in gangrene of the uterus, &c. and even where there have been no such immediate sources of putrefaction, there is often, upon opening the belly, a very disagreeable gust of air. To this source may perhaps be referred many of the tympanitic cases given by the older writers. Morgagni, upon many occasions, is too apt to overlook the origin of this air, generated by putrefaction in the body, counting it as natural and existing in the living body, and as escaping from the blood, where he says it counteracts the pressure of the atmosphere. For instance, he enumerates, in the history of a dissection, these appearances: The stomach and intestines were distended with air; the gastro-epiploic vein turgid with blood, which flowed out frothy when cut into; there was a hernia with beginning gangrene and bloody serum in the cavity of the abdomen: the heart was large and flaccid, with black frothy blood in it; not a vein through the whole body but was distended with air and blood; the scrotum was puffed up with air, and was observed increasing even during the dissection, *and the stench was so intolerable, that they were obliged to put a stop to the dissection.* Now, Morgagni's intention in giving this case is not to caution his reader against describing such accumulations of air to any other cause but putrefaction; but it is to illustrate an opinion he entertained, that appolexy was produced by air extricating itself from the blood, and stopping the circulation in the small arteries of the brain.

The tympanitis intestinalis, may be said to be a common occurrence, the intestines being often amazingly distended. I have seen two turns of the colon filling the whole abdomen, and compressing the small intestines, which were thickened, red, and fleshy; the distended intestine white, and free from inflammation, without any obstruction or any apparent cause, for such distension unless loss of tone in the intestines. In Haller's book of Pathological Cases, there is described a tympany of a peculiar kind (and similar cases are given by Morgagni, and in other collections); between the muscular and external coat of the intestines the air had raised vesicles, which, when opened, stunk intolerably; and Haller supposes this air to have been forced through the coat of the intestines, and only restrained by the peritoneal coat from forming a true tympanitis abdominalis; but no membrane in the living body will allow air, or any fluid to pass through it; and the coats of the intestines must have been totally destroyed before they could have allowed air to escape through them. It will be observed, that it is only by the contraction of their own coats that air or fæces can be expelled from them into the cavity of the abdomen, and not by the elasticity of the air contained in them; because, when distended by the air, the intestines being in contact with the general covering of the belly are supported by it, and were they like cobwebs they would never burst. I suspect that the air in the vesicles, in this case of Haller's also, was air generated by putrefaction; or like those vesicles which are found in brutes.

6. The worms which are found in the human intestines, are these, *lumbricus teres, tænia solium, tenia lata, ascaris, trichuris.* These worms are not accidental tenants but the intestinal canal is their proper abode, how they are produced it is difficult to imagine. I believe that there is a disease previous to their production and that it is not the evacuation of these animals which will cure a patient, but a change must be induced on the intestines themselves, the state favourable to their production must be removed.

7. *Intestina fæcibus infarcta.* Such is the title of many cases on record, but I give it a place here, in order to uge the dissector to take a somewhat more enlarged view of the principle of pathology, than to suppose that all the dreadful mischiefs enumerated by modern writers proceed from the accumulation of fæces and their irritation.

8. The lacteals are sometimes distended to six times their natural size. This I have not only seen when the mesentric glands have been large and obstructed, but in old people where the glands were remarkably small. 2. The mesenteric glands are very often diseased in children dying about

the period of weaning, they are large and full of cheesy matter; in children at a later period, I have found them forming a cluster as large as my fist, a soft grey coloured tumour. Why there is always a marasmus in such a case, is easily understood, since the nutricious fluids are denied admittance into the system. 3. I have found these glands full of a calcareous earth. 4. I have found them degenerated into a large bloody tumour. 5. They are often scirrhous. 6. Abcesses are not unfrequent in the mesentery, no doubt proceeding from the suppuration of these glands. 7. Steatomatous and even cancerous tumours are found in the mesentery and meso-colon. 8. Hydatids adhere to mesentery.

SECOND DISSECTION

OF THE

ABDOMINAL VISCERA.

After having carefully examined the natural situation of the viscera, and considered those varieties in their appearance which are likely to disconcert the dissector in investigating morbid anatomy, the intestines are to be removed in that order which may illustrate and confirm the ideas already obtained.

But when the object is a knowledge of the blood vessels of the viscera, the injection must be made before the intestines are roughly handled, or the delicate membranes of the omentum torn. The system of vessels to be injected before it is possible to study the vessels of the belly, is very extensive. It includes the aortic system, or arteries of the viscera; the venous trunks of the body; the veins of the floating viscera, viz. branches of the vena portæ; besides the venæ hepaticæ; biliary ducts, &c.

INJECTION OF THE VESSELS OF THE ABDOMEN.

Injection of the arteries.—The tube should, in the present instance, be inserted into the aorta immediately above the diaphragm: or the aorta being tied at this point, the injection may be made from the femoral or iliac arteries. If the injection be made from above, the thorax must be opened: in doing which, the margin of the ribs to which the diaphragm is attached should be left entire. This saves the trouble of tying the phrenic arteries, which would be cut in separating the diaphragm from the ribs. It will also be necessary upon the left side to cut the ribs nearer to the spine, that access may be had to the aorta. It lies deep in the chest, upon the left side of the spine, flat and empty, and covered by the pleura. All the vessels cut upon the edge of the abdominal integuments must also be tied, care being taken to include all the principal branches, as the epigastric artery. And if, at the same time, the thigh is not to be injected, the external iliac artery must be tied, and a cord drawn round the thigh. To inject the thigh minutely from the aorta in the thorax, requires a force that might probably burst the unsupported vessels of the intestines or stomach.* The intestines should be kept under warm water, or heated with sponges. The stomach also and bladder should be filled with warm water; and it should be remembered, that if the stomach be once distended too far, it will never be made to assume any thing of a natural appearance again. The cœliac arteries are those in which rupture is to be expected.

By this injection, all the arteries of the stomach and intestines, with the hepatic arteries, and those of the pelvis and bladder will be filled, while, at the same time, the membranes will be minutely injected.

Injection of the veins.—The veins also must be injected before the intestines are unnecessarily handled. There are no valves in the veins of the intestines. The liver may be injected from the ramifications of the veins in the mesentery; or the minute extremities in the intestines may be injected from the trunk of the porta. To find the vena portæ as it enters the liver, the stomach should be held

* By injecting from the thorax, much is sacrificed to the arteries of the viscera. When the thorax is not to be opened, the injection may be made from the femoral arteries, while the aorta is tied above the cœliac; but the injection always runs better from trunk to branch than in this retrograde course.

down, and the smaller omentum cleared away from betwixt the stomach and liver. The vein is then found covered in part with cellular substance, running obliquely across the spine, and parallel to the biliary duct. If uncertain of its situation, the substance of the liver may be pressed gently with the hand, or the blood urged along the veins of the intestines, when the vena portæ will rise from the confusion, a large dark blue vein.

If the veins of the intestines are to be injected, the tube may be inserted into the trunk of the vena portæ near the liver, and pointed downwards. But to inject the whole system of the vena portæ at once, a tube should be introduced into the ilio-colic vein. This branch is easily found, as it has its name from being subservient to the caput coli, and that part of the intestinum ilium which joins the colon, or the angle formed by the joining of the ilium and colon. It is only necessary, therefore, to fold back the small intestines from the right os ilium, and to expose the caput coli, and follow up the veins till they have assumed a size large enough to admit the tube. After puncturing and introducing the tube, there should also be a ligature put upon the vessel behind the tube, to prevent the injection from coming round and escaping. Before throwing in the injection, these veins should be repeatedly syringed with warm water, especially those of the liver. In throwing in the minute injection, it may be made to run more into the vessels of the intestines by pressing gently upon the trunk of the vena portæ. The vena cava abdominalis, and the veins coming into it from the liver, may be injected by tying the cava above the diaphragm close to the right auricle, and injecting from the femoral or iliac veins.

DISSECTION.

The small intestines are now to be taken away, by folding the colon over the margin of the chest, and searching for the beginning of the jejunum, where the small intestine comes out from under the mesocolon, and where it is connected to the spine; then the intestine being tied here with a double ligature, it should be cut betwixt the ligatures, and the gut should be separated from the mesentery, from this point downwards, following the convolutions of the small intestines, and leaving only a small portion of the ilion attached to the caput coli.

The intestines will now take a very simple form; only the colon and rectum, and the stomach, lying behind the colon, will be seen, and the duodenum coming from below it; and the course of the jejunum and ilium may be followed from the projecting portion of the duodenum along the edge of the mesentery, till the small intestines end in the caput coli. The whole of the great intestines are to be left.

Dissection of the mesenteric arteries. The colon should be blown up, and kept forming a full arch; then the vessels of the colon and of the rectum are to be dissected, and those of the mesentery, which lie in the middle. These comprehend the distribution of the upper and lower mesenteric arteries.

The superior mesenteric artery supplies the small intestines which have been cut away; and the right side of the great gut which remains. Its trunk is found coming out from under the mesocolon and stretching over the duodenum.

The inferior mesenteric artery is much smaller in its trunk, and less extensive in its distribution. It supplies the left side of the colon and the rectum; a branch runs down over the os sacrum into the pelvis, from which the whole artery has got the name of hœmorrhoidal.

The dissection is to be begun with the loose mesentery, by dissecting off the peritoneal coat and fat from the vessels. These arteries of the small intestines have no appropriated names, but compose one mass of innumerable branches, forming, before they reach the small intestines, frequent anastamoses and arches, by which the capacity of the branches combined must be wonderfully increased in proportion to that of the single trunk from which they arise.

From the upper mesenteric artery, upon the right side, three branches are given off to the colon.

The arteria ilio-colica, whose ramifications connect the branches which go to the small intestines, and those which go to the colon. It runs down in a direction to the caput coli, and last turns of the ilium. Its branches upon the small intestines inosculate with those branches of the superior mesenteric, distributed to the small intestines in general; and, upon the great intestine, it inosculates with the second colic branch of the superior mesenteric artery; viz.

The COLICA DEXTRA which will be found running from the root of the superior mesenteric artery across towards the right side of the colon, where it begins to rise over the kidney, inosculating largely with the last branch downwards and upwards with

The COLICA MEDIA.—This branch goes directly upwards from the trunk of the upper mesenteric artery, as it comes out under the mesocolon. After running a little way upon the mesocolon, it divides; and the division going towards the right side, makes a large circle upon the mesocolon, and forms a great inosculation with the right colic artery; while the other division, going towards the left side makes such another sweep, and joins with the left colic artery, which is a branch from the lower me entric artery. These two branches of the median colic artery give off the numerous ramifications, which supply a great extent of the middle part of the colon.

The INFERIOR MESENTERIC.—The branches of the inferior mesenteric artery are easily found.—The dissection may be made backwards, from the hœmorrhoidal artery lying upon the back part of the rectum. Proceeding up along the gut, numerous branches are found distributed to that part of the intestine which forms the sigmoid flexure. These are derived from the uppermost branch of the lower mesenteric, and as it supplies the left side of the colon, it is called the COLICA SINISTRA; it communicates with the median colic branch of the upper mesenteric artery and completes a great circle of inosculations, reaching all the length of the intestinal canal*.

OF THE ACCOMPANYING VEINS SEEN IN THIS VIEW OF THE INTESTINES.—The branches of the veins run here in company with the arteries, however different they may be in the direction of their trunks. Therefore the names and distribution of the one set of vessels being known, the other must be known also; for all vessels should be named from the parts to which they are distributed, and not from the trunks from which they are sent off; their distribution being constant, their derivation irregular.

The veins, as seen in this view of the parts, preserve a uniform course; their varieties consisting only in the direction of the trunks in which they are gathered to form the vena portæ.

Returning then upon the demonstration of the arteries—The *hæmorrhoidal vein*, rising from the back of the rectum, may be easily found, the *vena colica sinistra*, coming from the left part of the colon, the *vena colica media*, following the artery of that name, and returning the blood from the arch of the colon; the *vena colica dextra*, towards the right side of the colon, and the *vena ilio colica*, from the caput coli, then one great branch is seen promiscuously divided among the small intestines, and returning their blood to the vena portæ.

These veins are further traced in the next view of the intestines.

* In the dissection of the lower mesenteric artery, its root is found entangled by the nerves of the lower mesenteric plexus, formed by branches from the sympathetic, by branches from the superior mesenteric plexus, and great cœliac plexus. The lower mesenteric plexus, surrounding the trunk of the artery, sends branches out along the mesentery to the left side of the colon, and to the rectum.

THIRD DISSECTION

OF THE

ABDOMINAL VISCERA.

Containing the Dissection of the Cœliac Artery, of the Trunk of the Vena Portæ of the Arteries and Veins of the Stomach, of the Liver, Gall-ducts, and Pancreas.

Separate the arch of the colon from the stomach and lay it down.

There is now much difficult dissection. The stomach will be seen lying under the projecting liver; the spleen towards the left end of the stomach; and the pancreas under it, lying directly acros the aorta, reaching from the spleen to the duodenum, and involved in the root of the mesocolon.

The cœliac artery supplies all these parts lying in this upper division of the belly, above the mesocolon. It is the second artery of the abdominal aorta, and comes off at the point where the great artery seems extricating itself from the diaphragm. It comes directly forward from the aorta; a short trunk quickly dividing into branches.

The best way to dissect this artery, is to lay down the stomach and to dissect away the lesser omentum from betwixt the liver and stomach. The cœliac artery is then found, dividing at once into many branches; and as they depart in different directions from one point as from a centre, this is called the *axis arteria cœliacæ.*

The ARTERIA CORONARIA VENTRICULI will be found going off towards the left side, and spreading largely over the upper part of the stomach. If, in dissecting it where it goes off from the trunk of the cœliac, it is found to be larger that the other branches, then it may be expected to send a branch to the liver, and should be more cautiously dissected in that direction; viz. a little to the right, and then upwards, till it be lost in the fossa ductus venosi of the liver. When there is no branch sent to the liver, it holds its course to the left or superior orifice of the stomach. Here it divides into two branches: one of which encircles the cardiac orifice, and inosculates with the gastro-epiploic artery above the spleen; the other runs down the lesser arch of the stomach, sends a branch over the broad side of the stomach, and, continuing its course, inosculates with the pylorica, or *coronaria dextra.* In tracing these branches upon the lesser curvature of the stomach, we find several nerves, they are branches of the eighth pair of nerves, or par vagum, which is the nerve of the stomach.

The ARTERIA SPLENICA arises from the trunk, or axis of the cœliac artery. It passes under the stomach and along the borders of the pancreas, where it gives off the pancreaticæ parvulæ. Continuing its serpentine course it gives the vasa brevia to the stomach and small branches to the mesocolon. When it reaches the spleen, it makes a curve in its bosom, and enters it in several branches. It sends off from its branches in the spleen a more considerable branch to the stomach; which inosculating with the gastro-epiploic artery is called the gastro-epiploica sinistra. The artery of the spleen is tortuous; certainly not to allow the dilatation of the stomach: it is not the force of the blood in the artery which curves it, or makes it tortuous; nor does this tortuous form seem a provision for breaking the force of the blood, as the vein also is tortuous.—I have elsewhere assigned a reason for this.*

* See Anatomy, vol. iv. p. 134, &c.

The ARTERIA HEPATICA runs in a direction opposite to the splenic artery, towards the right side. After having run some way in the direction of the trunk of the vena portæ, it divides, nearly at the same place into four branches, which spread over the trunk of the vena portæ. First, there is sent off arteria gastro epiploica, so named from its chief branch; or sometimes called the duodeno-gastrica, from that branch of it which goes to the duodenum. This artery descending under the pylorus to gain the great curvature of the stomach, with its accompanying vein, catches the eye while the viscera are yet entire. It is seen beautifully distributed to the stomach and omentum; and reaching the left and obtuse end of the stomach, it inosculates largely with the splenic artery. As this gastro-epiploic artery runs across the under side of the duodenum, the pancreatico-duodenalis is sent off. It runs down the intestine, and sends a considerable branch along the pancreas.

The hepatic artery after sending off this branch almost directly divides into the right and left hepatic branches; and from the left branch is sent off the coronaria dextra, which turning backwards, spreads its branches upon the pyloric end of the stomach, inosculating with the proper coronary of the superior orifice, and with the pyloric arteries, which are numerous and important twigs from the surrounding greater arteries. This artery sometimes comes off from the trunk of the hepatic artery (as in the plan of the cœliac.) The left hepatic artery, climbing upon the vena portæ, enters the liver, and, separating into branches, continues attached to the great vein, and is distributed within the liver to the whole of the left lobe, the lobe of Spigelius, and part of the right lobe. The right hepatic branch, passing under the hepatic duct of the liver is distributed to the right lobe of the liver and the gall-bladder.

In dissecting the root of the cœliac artery and the aorta, betwixt it and the superior mesenteric artery much confusion arises, from the meshes of the cœliac plexus, and the branches coming to it from the semilunar ganglions of the splanchnic nerve, a division of the sympathetic nerve, and from the eighth pair upon the stomach. From this plexus an immense number of smaller nerves are sent out, forming lesser plexus, along the mesentery to the duodenum, liver, spleen, &c. but plans for the dissection of these nerves will be given in the succeeding part of this work.

Of the VENA PORTÆ.—The vena portæ is formed by the gathering together of the veins from the intestinal canal, and from the spleen and pancreas of the solid viscera. Near the liver these are collected from three great branches, answering to the cœliac, upper and lower mesenteric arteries. The trunk of the vena portæ, lies obliquely across the spine. The branch answering to the cœliac, is the splenic vein. It forms one of the great arms of the vena portæ in the belly; it is carried in the direction of the main trunk; it gathers the blood from the spleen, stomach, pancreas, and omentum.

The veins coming up from the lower part of the belly answering to the mesenteric arteries, are the mesenterica major, and the mesenterica minor. All the veins from the mesentery, and from one half of the colon meeting together, form the first of these; which, from its size, is the most important vein of the intestines. Its branches run in company with the extremities of the superior mesenteric artery, as they are spread from the duodenum, along the track of the intestines to the middle of the colon. It joins the trunk of the vena portæ.

The vena mesentreica minor carries back the blood from the left side of the colon, and from the rectum, accompanying the lower mesenteric artery in its whole course: and from the branch which mounts up upon the back of the rectum, it has been called the hæmorrhoidea interna. This vein joins sometimes with the splenica more commonly with the mesenterica major. As the great mesenteric vein goes up under the duodenum, it receives the veins of the pyloric orifice, and those answering to the pancreatico-duodenal artery: and as the trunk of the vena portæ runs across the spine towards the liver, it receives the veins from the right side of the duodenum, and lesser arch of the stomach, answering to the lesser coronary or right coronary of the stomach, then mounting obliquely upwards and towards the right side, it enters the porta of the liver, and dividing into two great branches, forms the great sinus of the liver.

In dissecting these veins, there is much cellular substance to be cleared away; and it is not easy, if the injection be at all brittle, to dissect upon their thin coats without cutting them, or breaking the injection.

As the vena portæ approaches the liver, it runs parallel to the ducts and the hepatic artery. They are here included in one sheath of cellular substance, viz. the capsule of Glisson. This was formerly thought to assist the circulation of the blood in the liver, by giving a pulsation to the vena portæ.

It will now appear that the vena portæ, is a vein performing the office of an artery in the liver, by distributing in it that blood which it collects from the arteries of the intestines. But the proper veins of the liver, the branches of the vena cava hepatica, return their blood directly to the heart. These in their extremities are distributed much like the vena portæ; but upon dissecting the under surface of the liver, they are found, when gathered into trunks, to turn away from the porta, and run up towards the attachment of the liver to the diaphragm, and enter into the inferior cava very near the heart.

The gall-bladder will be found on the under surface of the liver, half sunk into the substance of the gland; and when the liver is in its place, it is nearly horizontal. It is touched by the duodenum and colon, as their being found tinged with bile in bodies opened after death, demonstrates. The hepatic biliary duct comes from the substance of the liver; runs by the side of the great vessels; and is large compared with the cystic duct which does not come off directly from the gall-bladder but turns up a little upon its smaller end before it descends to meet the other duct, which it does at an acute angle. They run some way together before they join to form the ductus communis choledochus. This common duct, separating from the vena portæ runs down, behind the duodenum, and betwixt the lamina of the mesocolon; then entering the coats of the duodenum, it runs some way betwixt them before it opens into the cavity of the gut*; it generally enter by the same mouth by which the duct of the pancreas enters, although sometimes they enter separately. The gall-bladder and ducts may be injected from the common duct, and all the ducts may be filled, by introducing the pipe into the back part of the bladder. The nerves of the liver are very minute. They come from solar plexus, viz. from the eighth pair, and great sympathetic: they run in two divisions, viz. with the hepatic artery before, and with the vena portæ behind. There are likewise some twigs from the anterior plexus of the stomach.

As the opening of the common duct in the intestine is apparently the easier passage, how is the bile collected in the gall-bladder? The use which is naturally suggested to us, is, that it may prevent the perpetual discharge of the bile into the intestine, and reserve it to be mixed with the food as it passes the duodenum. But it is not easy to determine how this is done; whether by the distention of the intestine, and consequent pressure upon the gall-bladder; or by the contraction of the gut, and consequent opening of the mouth of the duct; or whether it be not an irritation of the mouths of the ducts themselves, by which the discharge into the intestine is regulated, and even secretion promoted. A calculus in the common duct must, if not discharged, disorder the whole system; but the cystic duct being smaller but more valvular, concretions formed in the bladder, if they pass the cystic duct, can generally pass the common duct. When there are calculi in the hepatic duct, the ducts which ramify in the liver must be enlarged; while the ducts below must shrink, and even the bladder and cystic duct must shrink. When the cystic duct is obstructed, then the gall-bladder shrinks; and when the common duct, then it is enlarged. There are cases of calculi making their way out by the umbilicus, and leaving a little ulcer discharging a yellow lymph. This happens by the enlargement of the gall-bladder, and its adhesion to the integuments. A case is given by Petit; who was so bold as to operate upon a circumscribed tumour presenting at this place; from which he extracted a calculus, and relieved his patient from extreme agony. But for the most part, those extraordinary cases of knives cut from the stomach, and bodkins from the groin, and stones from the gall-bladder, which at first seem impossible, are but the opening of a superficial abscess, where the foreign substance having gradually made its way outwardly is almost protruding; and it is only in such a state of the parts that the operation can be performed.

There are instances of worms getting into these ducts from the intestines, and even nestling and adhering in groups.

* To understand the nature of the entrance of the biliary and pancreatic ducts, open the duodenum, and examine it in water.

I.

OF THE VESSELS OF THE ABDOMEN, AND THE CIRCULATION OF THE LIVER.

The vena portæ, which receives the blood from the arteries of the abdominal viscera, is like the other veins of the body, comparatively of a larger size and thinner in its coats than the arteries. It gathers its branches into one great trunk, but when it has got into the liver, though it retains the character of a vein in the thinness and inactivity of its coats, yet it resumes the office of an artery; for it again divides into branches; and its blood does not flow from its extremities towards its trunk, but, like that of an artery, from the trunk towards the extremities.

To account for this further propulsion of the blood, the muscularity of the coats of the vein, and the alternate action of the abdominal muscles, is suggested in almost every book. But the coats of a vessel, though endowed with muscular power, can give no assistance in propelling the contained fluids, unless an alternate action be allowed. Now the veins having no pulsation, their muscular fibres contract their diameter only till the force of contraction is equally opposed by the force of the circulating blood; and they then become like rigid tubes. If, therefore, the muscular fibres of the veins are proved to exist, and supposed to accelerate the blood, a pulsation must be allowed also. Ingenious men may perplex even the plainest truths; but that the veins have no pulsation cannot be long a question, when the action of the heart and vessels is attended to. The uniform flow of blood in the veins is generally accounted for, from the supposed effect of the blood in a vein receiving the impulse of the heart by channels of unequal lengths. But though this may account for it, perhaps a still more satisfactory reason may be drawn from considering the consequence of the action of the two accelerating powers, the heart and arteries. The pulsation of the heart, by a gradation of forces, which it would be tedious to explain, is continued into the extremities of the veins. This is a fact acknowledged by all who wonder how the veins, like the arteries, do not answer to the stroke of the heart. The blood is carried forward to beginning of the veins by the contraction of the heart, at the same time that the arteries are dilating: and the arteries being dilated, they immediately contract and push their blood into the veins, which, alternating with the contraction of the heart, causes not an interrupted stream or pulsation, but a continued flow. The arteries beat because they receive a pulsation from the heart's contraction; but the veins being beyond the arteries, receive the force of contraction both of the heart and arteries; and these succeeding each other without interval, make a continued stream in the veins. To use a familiar example, they are in the situation of the nozzle of a double bellows.

If it were asked of those who say that respiration mechanically assists the circulation of the blood in the abdomen, whether these veins are more compressed during the contraction of the abdominal muscles, or during that of the diaphragm? they would hesitate; for there have been no experiments to ascertain whether the pressure upon the abdominal viscera be uniform or not. And surely, from considering the alternate action of the diaphragm and abdominal muscles, the one receding while the other acts, we must conclude that there is an uninterrupted pressure, and before it can be said that even the violent efforts of vomiting and coughing compress the abdominal veins or accelerate their blood, the state of the thorax in the same actions must be considered, and whether the pressure there be not equal to that in the abdomen. (See Observations upon the Action of the Diaphragm, Part III.)

II.

That a degree of pressure kept upon these veins by the abdominal muscles and diaphragm, is necessary, we know from an old observation of Bartholine, confirmed every day, that, upon opening the belly of a living dog, he observed the veins gradually swell, and become monstrously distended. There are frequent opportunities of observing in the human body the consequence of this tension being taken off; as in the evacuation of the waters in dropsy and in child birth, and even in the sudden discharge of wind from the intestines. In slighter cases, it is attended by a peculiar faintish feeling. Sometimes it proves fatal. In one case recorded by the younger Du Verney, the operator, mistaking for dropsy an habitual distension in the intestines with air, pushed his trochar into their cavity: the air,

rushed suddenly out, the abdomen became flaccid, and the patient died in a very short time. There are other cases, where the patient being wasted and feeble, a sudden discharge of wind while at stool has occasioned sudden death. But the effect is in part to be attributed to the disordered respiration proceeding from the relaxation and weakened action of the respiratory muscles.

III.

It strikes me, that there is in this dissection much deserving consideration, which has yet escaped the notice of pathologists. 1. The first thing which must occur to us as a great peculiarity in the liver, is the number of its vessels, and then again, this vena porta may be considered as being the very remotest part from the influence of the heart. If therefore, debility happen to be the disease of the vascular system, it is scarcely possible but that the liver must suffer in the greatest degree. Hence the frequent complaints in the liver of those whose constitutions are exhausted.

2. The liver, it must be perceived, depends for its blood in a great measure on the state of excitement of the stomach, intestines, spleen, and pancreas, and unless the arterial system of the viscera be active, there must be a slow motion of the blood in the vena portæ. 3. It is further evident that the secretion of the liver is the stimulus to the intestines. 4. As the liver, stomach, and intestines are thus mutually connected in function, so are they united by nervous connection and sympathy. These considerations explain more of the common diseases of the abdominal viscera, than the most minute account of the *tubercles* of the liver. But to follow the subject now, would lead us from our proper object.

LAST DISSECTION

OF THE

ABDOMEN.

The cavity of the abdomen will now be freed from all the confusion of the viscera. But still a tedious dissection is required to shew the muscular and tendinous parts of the diaphragm; the passages for the vena cava, the œsophagus, and aorta; to display the muscles of the loins, the kidneys, and ureters, the vena cava, and the general distribution of the aorta.

The diaphragm is the septum which divides the thorax from the abdomen. It arises muscular from the borders of the chest, and tendinous from the vertebræ of the loins. But it has no insertion, unless the mediastinum be so considered; its action is within itself; it moves no parts as other muscles do by its contraction, it alters its own convexity, enlarges the chest and draws tight the membrane around the heart. Before opening the thorax, it may be seen how the middle part of the diaphragm is retired up into the thorax, forming a large concavity which receives much of the abdominal contents; and how it is sucked up and made tense by a vacuum in the thorax. In this state, if the thorax be opened or punctured, the diaphragm is seen to fall flaccid and loose. Observing this, the effect of the action of this muscle must be easily understood: that, by the contraction of its muscular part, the arch which it forms into the thorax approaches to a plane, and consequently enlarges the capacity of the thorax and allows the lungs to receive the atmospheric air. The great muscle of the diaphragm, as it rises from the borders of the chest on the inside, should be first dissected. This extensive origin is to be followed round to the false ribs, and where it approaches the spine, a kind of ligament is found passing from the twelfth rib to the vertebræ, forming an arch over the upper part of the psoas magnus. This *ligamentum arcuatum*, it will probably be found difficult to demonstrate satisfactorily; for the fibres of the diaphragm here are strong, yet loose and flabby, and not easily dissected, as it lies under the kidney, and under much loose cellular substance, and soon becomes putrid. Down upon the spine, an irregular sheath of tendons will be found lying flat and shining, and arising from the ligaments of the lumbar vertebræ. These origins, or feet of the crura of the diaphragm, may be counted; but it is more important to observe the muscle connected with these tendons, viz. the smaller and posterior muscle of the diaphragm; and how these crura stretch over the aorta and surround it; while, by the direction of their fibres, they are prevented from compressing the great artery. These muscular fibres after passing the aorta, mingle; but they again separate to give passage to the œsophagus, and again intersect each other above the œsophagus. The central tendon is the tendon of this great circle of muscle. The fibres composing it are intricate, and form irregular interlacements, which yet keep

a wonderful similarity in different subjects. Through this central tendon the vena cava pierces, to go up into the thorax. Here there are no muscular fibres, the passage is large and free.

The fleshy muscle filling up the space at the side of the spine, is the psoas magnus. It is very strong, supporting the trunk upon the lower extremity, and moving the thigh upon the pelvis. Its uppermost origin is from the last vertebræ of the back; at which place it is covered by the diaphragm: from this point downwards to the sacrum, it arises from the tranverse processes and sides of the vertebræ; which origins are concealed by its belly. It runs under Poupart's ligament out of the belly, and turns over the head of the thigh bone to be inserted into the lesser trochanter of that bone.—The tendon of the psoas parvus will be found running down on the inside of the belly of the great muscle. The iliacus internus filling up the cup of the ala ilii, may be dissected at the same time, as it accompanies the psoas, and has the same insertion.

To follow these at present to their insertion, would be encroaching too much upon the dissection of the thigh.

To dissect the great vessels of the abdomen when injected, is no very difficult matter; for it is but cleaning away the cellular substance from them. It may be observed how the aorta comes out under the diaphragm. It enters the abdomen upon the left side of the spine; but proceeding downwards, it shifts more towards the middle of the spine.

The vena cava in the upper part of the belly, as in the breast, does not lie close to the back-bone, but proceeds from below upwards, somewhat removed from the spine, towards the perforation of the diaphragm.

The abdominal branches of the aorta may now be enumerated. 1. The phrenic arteries, sent off as it passes under the diaphragm, or perhaps from the cœliac artery. 2. The cœliac artery sent off to the stomach, liver, and spleen. 3. The superior mesenteric artery. 4. The emulgents; one sent off on each side to the kidneys. 5. The lower mesenteric artery, &c.

Besides these, the aorta gives off the the lumbar arteries, which are seen dipping under the psoas magnus of each side. As the emulgent arteries go off from the aorta betwixt the superior and inferior mesenteric arteries, it happens that all the great arteries of the viscera are sent out within a very small space; and at this point aneurisms of the abdominal aorta are most frequently found.

Before the emulgent artery enters the kidney, it gives off small branches to the glandula atrabilaris (which is a small triangular body, seated like a cap upon the upper end of the kidney, and which dwindles in the adult), and also to the fat surrounding the kidney. The parts surrounding the kidney likewise receive arteries from other sources, even from the phrenic arteries; and besides each of the small glands attached to the kindey has an artery peculiarly its own coming from the aorta at the root of the upper mesenteric artery. On the fore part of the aorta will be found small twigs running to supply the lumbar glands. But the arteries which there is most danger of destroying, are the spermatic arteries, which are extremely small, running down parallel to the aorta. The left spermatic artery comes more frequently from the emulgent artery than from the side of the aorta; the right more generally from the side of the aorta. The artery of each side, running down along the psoas muscle, is joined by its accompanying vein from the emulgent or renal veins: then descending it courses round the brim of the pelvis to the abdominal ring, where it meets the vas differens as it is about to drop down into the pelvis to join the vesiculæ seminales upon the neck of the bladder.—The emulgent, and consequently the spermatic veins do not empty themselves, like the veins of the other abdominal viscera, into the vena portæ, but into the vena cava inferior, so do all the veins of the solid walls of the abdomen. The spermatic veins are the only vessels within the abdomen having valves, which is evidently a provision for their descent out of the abdomen into the *scrotum*.

NERVES.

To point out in this dissection the nerves which must be cut; how the anterior crural nerve is composed, the connexions of the intercostal nerve; and the numerous and intricate branches going to the muscles of the loins and belly, would need a long description which would be useless, since they must be more fully described in the other parts; It may, however, be remembered that to dissect these nerves

completely, so as to have a comprehensive view of them, the ribs of one side must be cut far down, the diaphragm separated from the margin of the ribs on the same side, while it is kept attached at its tendinous origins from the lumbar vertebræ, and held out so that the side of the spine may be seen in the thorax and down to the pelvis, then the kidney being lifted from its seat let it be held out, attached only by the ureters and emulgent vessels. In this situation of the parts, the sympathetic and its connexions with the spinal nerves, may be dissected in the thorax above the diaphragm: and the anterior branch or splanchnic nerve, sent off in the thorax, can be traced through the diaphragm, to the ganglions about the root of the cœliac artery: and the continuation of the sympathetic nerve may be seen running near the root of the ribs, down the spine. As the sympathetic descends, it comes more towards the fore part of the bodies of the vertebræ: here it receives additions from each lumbar ganglion, and sends at the same time numerous small branches over the great vessels, and finally ends in the plexus within the pelvis.

EXPLANATION OF THE PLATES

IN

PART I.

PLATE I.

OF THE ABDOMINAL MUSCLES.

Fig. 1. While, from the obliquity of the figure, we have a full view of the most important part of the demonstration, the external oblique muscle, the others; viz. the rectus and transversalis of the right side, are necessarily seen fore-shortened by the convexity of the belly.

A, The origin of the EXTERNAL OBLIQUE muscle of the abdomen from the ribs, making serrated indentations with the serratus major anticus.

B, The stronger fibres of this muscle coming round upon the loins, where it is covered by the latissimus dorsi.

C, The SERRATUS MAJOR ANTICUS.

D E, The INTERNAL OBLIQUE MUSCLE of the abdomen,—its fibres spreading from the central origin upon the spine of the os ilium and sacrum, to its insertion into the false ribs, linea semilunaris and os pubis.

* The fibres of the CREMASTER MUSCLE as sent down by the internal oblique muscle.

F F, The fleshy portion of the RECTUS muscle.

G, The PYRAMIDALIS.—It is uncovered on one side, on the other included in the sheath.

H, The origin of the PECTORALIS MAJOR, which intermixes its fibres with the obliquus externus and rectus muscles.

a a a, The LINEA ALBA.

b b b, The LINEA SEMILUNARIS.

c c c, The RECTUS MUSCLE shining through the transparent tendon of the external oblique muscle.

d, The tendon where it splits to form the ring.

e, The SPERMATIC CORD.

f, The FEMORAL ARTERY.

g, The FEMORAL VEIN.

h, INGUINAL GLANDS and cellular membrane.

i, The EPIGASTRIC ARTERY.

k, The CIRCUMFLEX ARTERY of the ilium.

Fig. 2. Plan of the relation of the cord and epigastric artery, in relation to the femoral hernia.

A, The GUT.

B, The EPIGASTRIC ARTERY.

C, The SPERMATIC CORD.

PLATE II.

In Fig. 1. the view we have of the viscera when first laid open, is represented. As partial turns of the intestines only are seen here, the second figure is added, to show, in one view, the whole course of the intestinal canal; and, as the letters mark the same points in both figures, the reader can easily find the situation of the parts in the body, and their place in the canal.

In both figures, a a a marks the arch of the colon—b, The sigmoid flexure of the colon—(In Fig. 1. c, The liver—d d, The omentum)—In Fig. 2. e, The caput coli—f, The rectum—g, The duodenum, before it sinks under the mesocolon to appear again at i—h, The pylorus—k, The jejunum—l, The ileon—m, The appendicula vermiformis.

PLATE III.

Fig. 1.—The colon, and contents of the pelvis, dissected out of the body, and their arteries, displayed.—A, The superior mesenteric artery, arising from the aorta—B B, The mesocolon—C, The inferior mesenteric artery—D, The branches of the superior mesenteric artery, which supplied the small intestines.

E E, The ilio-colic artery—F, The right colic artery—G, The median colic artery—H, The hœmorrhoidal artery—I, Branches going to supply the sigmoid flexure of the colon—K, The lumbar arteries, going off from the aorta—L, Common iliac artery—M, Middle sacral artery—N, External iliac—O, Ischiadic arteries—P, Posterior iliac—Q, The pudic artery. It is seen sending off the middle hœmorrhoidal artery to the rectum; which, from its size, is more like its distribution in the female pelvis—R, Hypogastric artery. The ligament running up to S, shows the remains of the umbilical arteries——a a a, Arch of the colon—b, Sigmoid flexure of the colon—e, Caput coli—f, Rectum—g, Veins returning the blood from the penis—h, Prostrate gland—i, Vesiculæ seminales—k, Vas deferens, with the spermatic artery arising from the aorta, joining it where it is turning over the pin.

Fig. 2.—A plan of the distribution of the cœliac artery, assisting Plate IV.—A, Aorta—B, Upper mesenteric artery—1, Trunk of the cœliac—2, Splenic artery—3, Coronary artery of the stomach—4, Hepatic artery—5, Gastro-epiploic artery—6, Right hepatic branch—7, Left hepatic branch—8, Artery going to the gall-bladder—9, Pancreatico-duodenalis—14, Artery to the pancreas; and the twigs from the splenic artery may be seen coming from the under side of that artery—10, Vasa brevia—11, The left gastro-epiploic artery—12, Its inosculation with the coronary—13, Inosculation betwixt the right coronary and pyloric artery—15, Two phrenic arteries, arising in one trunk from the cœliac.

PLATE IV.

Fig. 1.—a a a, The liver in outline—b, The round ligament, which is the remains of the umbilical vein—c, The broad ligament of the liver—d d, The stomach distended, showing the vessels ramifying upon its surface—e, The duodenum.

In this view, the splenic vein is cut, to allow the distension of the stomach.—A, marks the vein coming out from the spleen—at B, it is seen running towards the vena portæ—C, The trunk which returns the blood from the lower mesenteric artery—D, The trunk answering the distribution of the upper mesenteric artery—E, The trunk of the vena portæ, formed by the three branches, B, C, D—F, Remains of the umbilical vein—G G, The cava abdominalis, running up behind the liver to receive the hepatic veins, H H—I, The gall-bladder, with the cystic duct reaching down from it to join the hepatic duct, K——1, The trunk of the cœliac artery—2, The splenic branch—3, The superior coronary artery—4, The hepatic artery—5, The gastro-epiploic artery—6, The right hepatic artery, sending off the cystic branch—7, The left hepatic artery, sending off the pyloric artery, 8—g, The spleen.

Fig. 2.—The gall-ducts and pancreas.—I, The gall-bladder—K, The hepatic duct—L, The cystic duct—M, An acute turn of the cystic duct, reflected upon the gall-bladder—N, The common duct—O, A stone in the hepatic duct—P, The pancreas, seen upon its under side—Q, Part of the duodenum.

Fig. 3.—The stomach, with the omentum and spleen.—d d, The stomach—c, The omentum—e, The duodenum—L, The pyloric orifice—h, The cardiac orifice—f, The lesser curvature of the stomach, with the little omentum attachedto it—9, The spleen.

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Plate I.

Fig. 1.

Fig. 2.

Engraved by J. Grant from a Drawg. by Charles Bell. EDINr.

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Fig. 1.

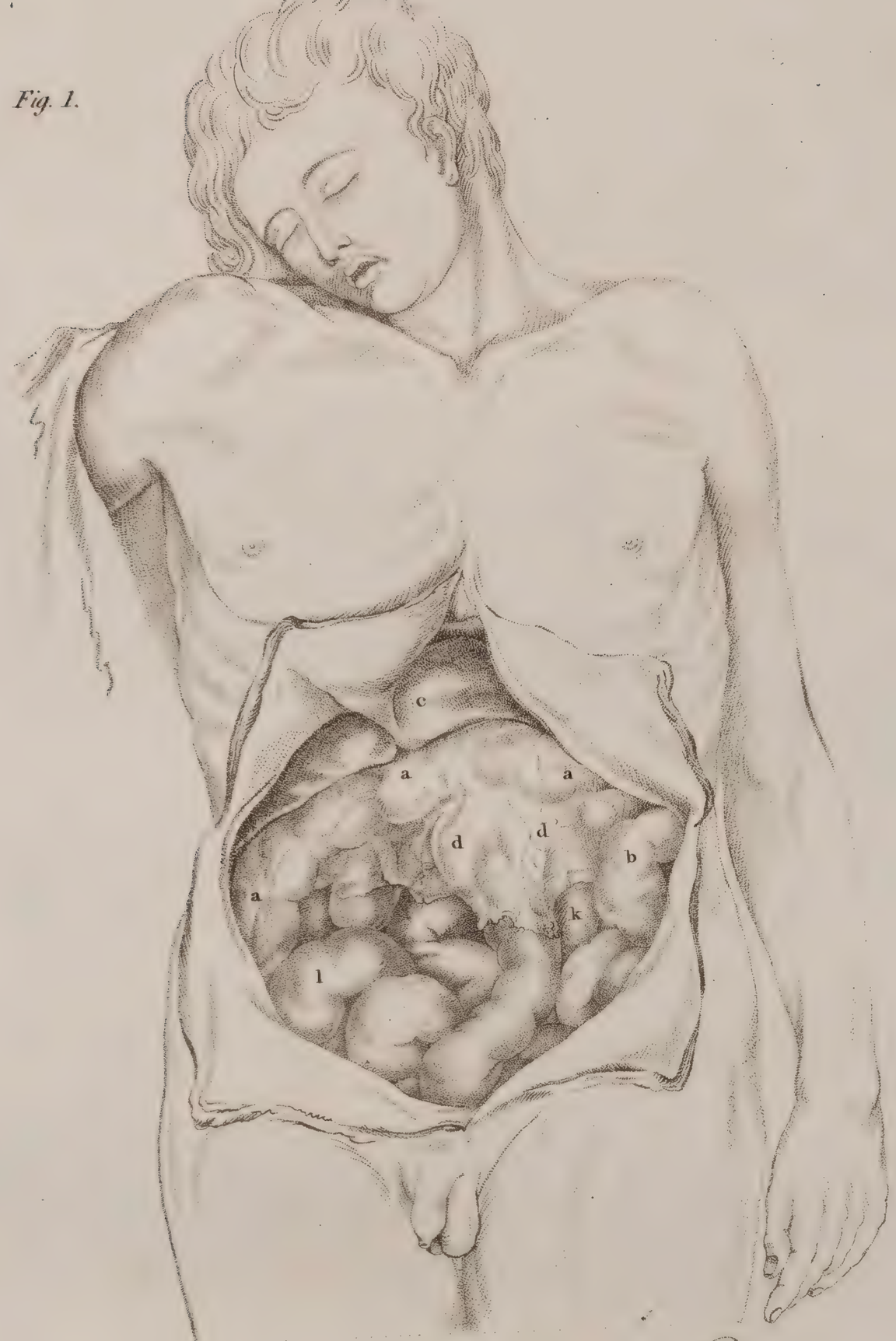

Fig. 2.

Drawn by Charles Bell.

Pub. Nov.r 1797 for C. Bell Edin.r as the act directs.

Engd. by R. Scott.

Fig. 1.

Plate 3d

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Fig. 1.

Fig. 2.

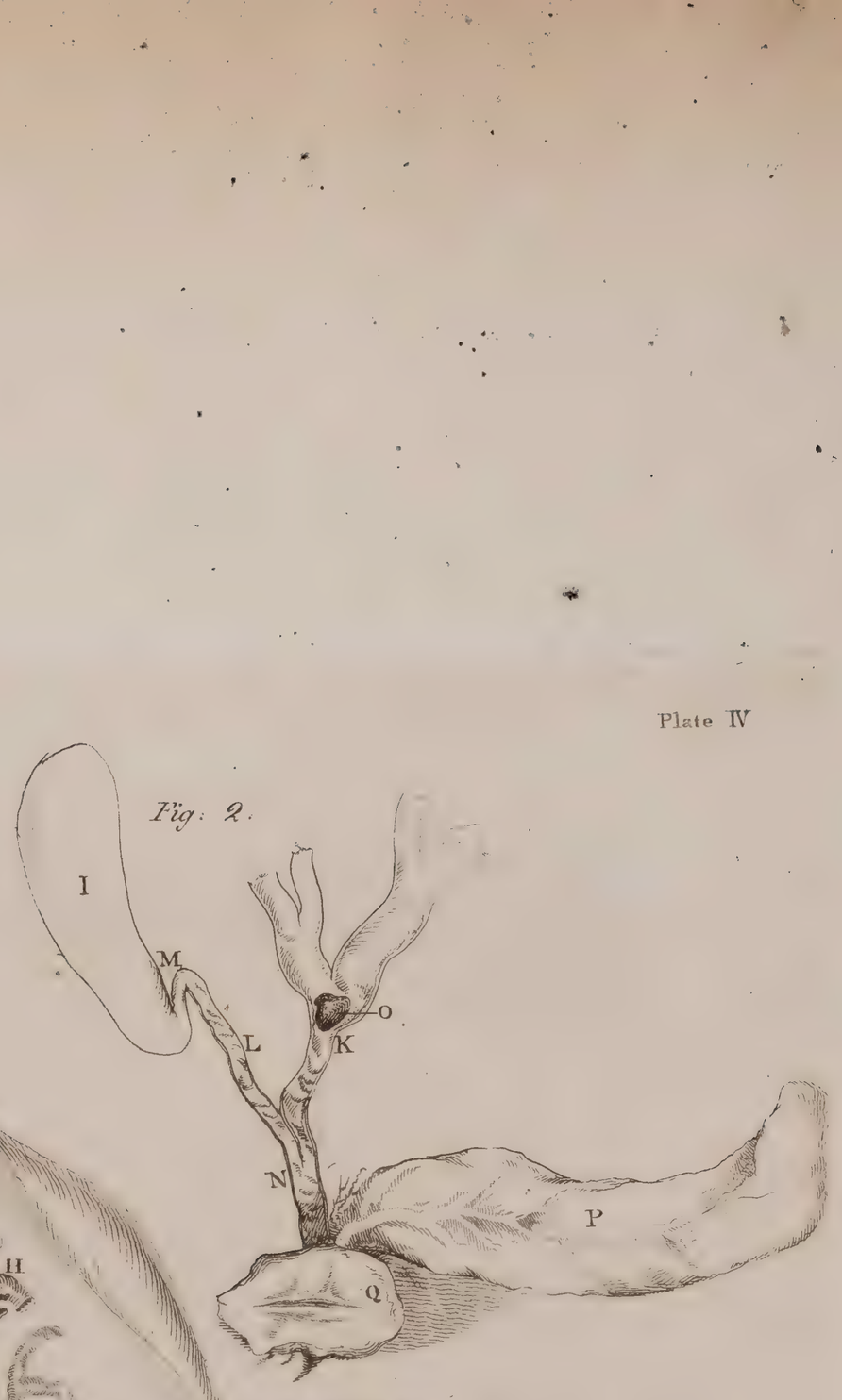

Fig. 3.

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A

SYSTEM

OF

DISSECTIONS.

PART II.

CONTAINING

THE ANATOMY AND DISEASES

OF THE

THORAX.

WITH PLATES.

SECOND EDITION.

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OF THE

THORAX.

THE preſent ſubject ſhall be divided in ſuch a way, that each branch of it may be comprehended in one diſſection, or view of the parts, as they lie in the dead body: And thoſe points of the anatomy ſhall be chiefly dwelt upon which are uſeful in diſſection, or in underſtanding the local or organic diſeaſes.—The two firſt diſſections of the thorax naturally include the muſcles and blood-veſſels which lie upon the breaſt and lower part of the neck;—then, proceeding to the viſcera, the appearance of the heart, lungs, and mediaſtinum, upon lifting the ſternum, makes the ſecond diviſion;—next the manner of diſplaying the heart is to be explained;—afterwards the injection of the heart, with the diſſection of the great veſſels proceeding from it.—Laſtly, the morbid anatomy of the breaſt will ſolicit attention:—firſt, aneuriſms, and the diſeaſes of the heart and larger veſſels, with the circumſtances which are to be obſerved in the diſſection of thoſe diſeaſes;—and, ſecondly, the diſeaſed appearances of the lungs, of the pleura, and of the cavity of the cheſt in general.

It may, however, be proper further to obſerve in this place, that in explaining the ſituation of the heart and great veſſels, and the play of the lungs, it is impoſſible to overlook the deficiencies in the accounts that are given of the mechanical action of the heart and vaſcular ſyſtem, and of the effect of reſpiration upon the action of the heart, or rather of the manner in which its effect upon the heart and veins is counteracted. And it ſurely will not be thought too great a departure from the plan and limits of this book, to touch ſlightly upon theſe important points;—they are points ſuſceptible of ſuch clear explanation, that they muſt be conſidered rather as hitherto neglected than as miſunderſtood.

FIRST DISSECTION OF THE THORAX.

The Diſſection of the Muſcles and Blood-veſſels which lie upon the outſide of the Cheſt, and lower part of the Neck.

NOTHING confounds a perſon more in diſſection than an ignorance of the parts which immediately ſurround that upon which he is employed: therefore, in explaining the diſſections of the outſide of the cheſt, it is proper to point out, not only the muſcles, and the branches of arteries which lie upon the cheſt, but thoſe likewiſe which lie in the axilla, and upon the neck, as being ſtrictly connected with them in every uſeful inference to be drawn from the anatomy of this part.

To follow the diſſection as repreſented in Plate V. (which is ſcrupulouſly drawn from the ſubject), make an inciſion from the thyroid cartilage down the middle of the ſternum, and extending below the ſcorbiculus cordis; then make an inciſion in the direction of the clavicle, and over the top of the left ſhoulder. In diſſecting the integuments of the breaſt, carry the knife in the direction of the laſt inciſion; by which the pectoralis major muſcle (a b c), and the deltoid muſcle (d), will be ſmoothly diſſected in the direction of their fibres.

No faſcia will be found expanded over the muſcles which lie upon the cheſt; but the fibres of the muſcles are ſeparated from the fat lying under the ſkin by a thin aponeuroſis of an opaque and milky whiteneſs in children, which adheres cloſely to them, and is not eaſily diſſected away, unleſs very regularly done, as the diſſection of every muſcular part ought to be. The PECTORALIS MAJOR ariſes from the fore part of the clavicle (e), from the ſternum (c c), and from the cartilaginous endings of the fifth and ſixth ribs (b f). From the origins of ſuch extenſive flat muſcles as this, the fibres are generally prolonged into faſciæ, ſcarcely diſtinguiſhable from the common membrane. Of this kind are the fibres which ſtretch acroſs the ſternum from one pectoral muſcle to the other, and are connected with the perioſteum. So conſiderable is the membrane reſulting from the extended margins of the PECTORAL MUSCLE (b f), the SERRATUS ANTICUS (g g g), the RECTUS (h), and OBLIQUUS ABDOMINIS (i i)—that they may all be lifted at once from the ribs, and yet be preſerved attached to each other. A ſlip (b), taking its origin from the ſixth rib, goes up to the pectoral muſcle (a k). The fibres of the pectoral muſcle are ſeen converging to form the tendon, by which, turning round into the axilla, it is inſerted into the arm-bone. It will be obſerved, that the upper portion of the muſcle, ariſing from the clavicle (e a), deſcends, in a direct line, to its inſertion at (l); while that portion of the muſcle which comes from the lower part of the breaſt (k) twiſts as it goes round into the axilla, and is inſerted into the arm-bone, nearer its head than the part of the tendon at (l) anſwering to the upper margin of the muſcle (a).

The origins of the OBLIQUUS DESCENDENS ABDOMINIS are marked (i i i).—The SERRATUS MAJOR ANTICUS (g g g), is laid like a hand broad upon the cheſt, with its digitations extending upon the ribs. It is thin and flat where it ariſes by its ſerrated origins (from all the true ribs except the firſt, and from three of the falſe ones): but as it retires under the latiſſimus dorſi (m), its fibres converging, it acquires a conſiderable thickneſs. It is inſerted in the backmoſt edge or baſe of the ſcapula.

Drawn by Chas Bell

Engraved by I Grant

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For the origins of the OBLIQUUS DESCENDENS ABDOMINIS (i i), and of the RECTUS (h), ſee the diſſection of theſe muſcles, page 3. and 4. The DELTOID MUSCLE (d d) covers the ſhoulder-joint with a fleſhy cuſhion. It is naturally divided into three portions by cellular membrane and fat: one diviſion comes from the clavicle; another from the acromion proceſs of the ſcapula; a third from the ſpine of the ſcapula. It is inſerted by a ſhort tendon, encircling the arm-bone about one-half of its length from the head.

OF THE BLOOD-VESSELS CONNECTED WITH THE DISSECTION OF THESE MUSCLES.

Betwixt the deltoid and pectoral muſcles there is found cellular membrane and fat; and from the upper part of this interſtice, and near the clavicle, a conſiderable branch of an artery (1) comes up from the ſubclavian artery, and is diſtributed over the ſhoulder and upper part of the pectoral muſcle. This is the RAMUS SUPERFICIALIS ARTERIÆ THORACICÆ ACROMIALIS of Haller, or a branch of the third thoracic artery, as commonly enumerated. If this branch be diſſected towards its origin (by ſeparating the pectoral and deltoid muſcles), its branches under the pectoral muſcle will be ſeen, and alſo the trunk of the ſubclavian vein (2) originating from the baſilic and cephalic veins; and behind it the ſubclavian, or rather, as it proceeds downwards, the axillary artery (3). It is here, in the angle of the joining of the clavicle (n) with the acromion proceſs (o) (which projects upon the top of the ſhoulder and over the head of the arm-bone), that the attempt to compreſs the axillary artery is to be made in operations upon the joint, &c.; or the attempt is made above the clavicle, and at the outer edge of the origin of the maſtoid muſcle (q) from the clavicle. The ſituation of this artery is better ſeen in the next Plate (3), where the pectoral and deltoid muſcles being taken away, it is ſeen defended in part by the clavicle (E), and paſſing under the pectoralis minor (L).

Upon the fore part of the pectoral muſcle, again, ſeveral ſmall twigs of arteries will be found coming up through the interſtices of the ribs (4 5 6). Theſe are branches of the internal mammary artery, which through its whole courſe is ſeen (4 4 4) in the Additional Plate VI. Theſe, when minutely injected, are ſeen inoſculating freely with each other, and with the twigs ſent from the axillary and ſubclavian arteries. The arteries coming round from the axilla by the lower edge of the pectoral muſcle are the extremities of the long thoracic artery (a branch of the axillary artery), which is alſo called the pectoral or external mammary artery (7). In the next figure it is marked 8.; it is there raiſed from its courſe upon the ribs.

All theſe arteries (and chiefly the laſt mentioned branch) throw out their blood in the extirpation of the mamma. The intricate ſituation of the axillary glands (8) ſhould be obſerved, that it may be underſtood how far theſe glands, being enlarged and diſeaſed, may encroach upon the trunk of the axillary artery. A very accurate and uſeful view of the axilla is given in the Firſt Plate of the Second Volume.

In diſſecting above the clavicle, and in carrying back the flap of ſkin from the ſide of the neck, in the angle betwixt the ſterno-cleido-maſtoideus muſcle (q r) and the trapezius (s), the fat will be found in moſt ſubjects looſe and watery, and of a granulated appearance, eſpecially in young ſubjects. This confuſed fatty maſs muſt not be taken away rudely, for under it lie many important parts *. The EXTERNAL JUGULAR VEIN (9) will be found cloſe by the outer edge of the maſtoid muſcle, and paſſing under the clavicle at the angle formed with it by the origin of the maſtoid muſcle (q), to join the ſubclavian vein, a conſiderable artery (the TRANSVERSALIS COLLI, a branch of the lower thyroid) will be obſerved (10),

* Theſe parts are more fully diſcuſſed in the Second Part of Volume II.

ſending its branches all over the ſide of the neck, and round under the trapezius muſcle. Betwixt this artery and the root of the external jugular vein, the OMO-HYOIDEUS MUSCLE (t), a long and flat muſcle, will be ſeen paſſing obliquely upwards at (v), to the os hyoides; and as it goes under the maſtoid muſcle, it may be ſeen degenerating into a middle tendinous part. Under this muſcle again, and from betwixt the origins of the ſcaleni muſcles (w), the cervical nerves are ſeen deſcending to form the axillary plexus. The ſmall lymphatic glands (11), the GLANDULÆ CONCATENATÆ, may be obſerved lying upon the ſide of the neck. And further, it may be obſerved, that the ſmall nerve (13) which paſſes backwards over the maſtoid muſcle, and which lies cloſe to the muſcle and under the branches of the external jugular vein, is the NERVUS ACCESSORIUS, which comes out from the ſkull in union with the eighth pair. Lower down, behind the maſtoid muſcle, and lying upon the ſcaleni muſcles, there is found a delicate nerve (12), reſulting from the cervical nerves; and this is the phrenic or diaphragmatic nerve, which ſhould be carefully preſerved for the demonſtration of the nerves of the thorax.

It will be immediately underſtood how this part of the root of the neck, and juſt over the clavicle, forms the moſt deadly aim of the aſſaſſin; for his knife paſſes at once into the breaſt, and pierces the great veſſels near the heart.

More towards the fore part of the neck we may obſerve the following parts. Upon lifting the maſtoid muſcle a little from its ſeat, and holding it aſide, the continuation of the omo-hyoideus muſcle (v) is ſeen paſſing upwards, and ſpreading into a ſecond belly. Under this the CAROTID ARTERY (14) and JUGULAR VEIN (15) are found lying in their ſheath; and betwixt them the PAR VAGUM, or eighth pair of nerves (16). A little more towards the fore part of the trachea a ſmall nerve is found coming down from the root of the tongue, and from under the angle of the jaw, viz. the DESCENDENS NONI (17).

Upon lifting back the maſtoid muſcle, the flat ribbon-like muſcles of the throat are found ſo accurately laid upon each other, and embraced and connected by the cellular ſubſtance, that the individual muſcles are ſcarcely to be diſtinguiſhed before diſſection. The thyroid veins, lying upon the fore part of the throat, ſhould be preſerved; they run down in a direct courſe from the thyroid gland to the trunk of the left ſubclavian vein as it croſſes the top of the cheſt.

If the whole ſide of the breaſt and neck be thus regularly diſplayed, there will be no difficulty in lifting the outer layer of muſcles, and diſſecting the leſſer pectoral muſcle and ſubclavian muſcle, and all thoſe parts which are ſeen in the next diſſection.

OF THE MAMMA.

The mamma in the female ſubject ſhould be attended to. It is ſeated on the great pectoral muſcle. Its bulk is greatly made up of the fat which ſurrounds the proper gland. The central glandular part is a congeries of leſſer glands connected by their ducts and veſſels, and inveſted in a cellular membrane. It has its arteries, 1ſt, from the internal mammary artery, the branches of which, ſpreading betwixt the pleura, paſs from betwixt the ribs, and through the pectoral muſcles, into its ſubſtance. 2d, From the external mammary or thoracic arteries, branches of the ſubclavian artery. 3dly, From the intercoſtal arteries. Theſe become more important branches, from their increaſed ſize, when the gland is diſeaſed, hardened, and enlarged.

They all form anaſtomoſis with each other. The external mammary artery alſo forms a very remarkable inoſculation with the epigaſtric, by which Boerhaave and Whyte explained the ſympathy of the womb and breaſt; a connexion which ſurely depends upon other laws of the economy. The veins are

very numerous, and pafs fuperficially under the fkin. In women giving fuck, they become enlarged, and very evident.

The lobulated ftructure of the gland has much of the cellular membrane interpofed; and this adipofe membrane both inveſts the gland on the outfide, and alfo connects it with the pectoralis major. The lymphatics run towards the axilla, and pafs through the axillary lymphatic glands, which are feen in the firft Plate of Volume II. Thefe glands are confequently affected when the mamma is difeafed.

ETCHING OF THE INJECTED BREAST.

A, The NIPPLE, or PAPILLA. B, The LACTIFEROUS DUCTS, injected with mercury. It is only when diftended that they take this irregular varicofe-like form. C C, The lobulated appearance of the gland. D, The extremities of the ducts. The milk during nurfing being continually fecreting into thefe ducts, is collected gradually into the more varicofe and dilated parts, D. The ducts again contract before they pafs into the nipple, and the ftructure of their orifices is fuch, as only to allow the milk to pafs when the nipple is drawn out by the fucking of the child. The areola, or dark-coloured zone furrounding the nipple, is of a paler colour in girls; it changes to a darker colour during menftruation in women with child, or when giving fuck. It has a glandular ftructure to prevent its excoriation, which, however, fubjects it to ulceration and difeafe, like other glandular parts.

SECOND DISSECTION OF THE THORAX,

Being the Continuation of the Diſſection of the Blood-Veſſels and Muſcles.

If we pay ſufficient attention to that ſtage of the diſſection which the annexed Plate repreſents, we ſhall derive from it much uſeful and practical knowledge; and it will be found to facilitate the acquiſition of the knowledge of other very important parts, viz. the lower part of the neck; the anatomy of the axilla; the manner in which the diaphragm riſes into the thorax; its ſtructure and connections. It will alſo greatly illuſtrate the pathology of this part. I ſhall therefore, in the firſt place, give a full explanation of the Plate, and then make ſuch remarks as I think may be uſeful, and which neceſſarily reſult from this piece of anatomy.

EXPLANATION OF ADDITIONAL PLATE V.

The thorax having been ſeparated from the lower part of the trunk; the CLAVICLE, the SCAPULA, the LESSER PECTORAL MUSCLE having been diſſected, and left on the left ſide in their natural ſituation; the diaphragm likewiſe having been carefully diſſected; the thorax was raiſed, and put into the poſture for drawing. This ſubject had been a remarkably ſtrong man; the parts large and well marked, the veſſels particularly large and tortuous. It is the ſame ſubject from which I made the drawing of the cutaneous veins and nerves of the arm. This and the preceding Plate will be greatly illuſtrated by turning to the firſt Plate of the Second Volume, which gives a minute view of the anatomy of the axilla.

THE BONES.

A, The STERNUM.

B, The ENSIFORM, or XYPHOID cartilage.

C C C C, The cartilages of the true ribs.

D D D, The five falſe ribs.

E, The CORACOID PROCESS of the ſcapula.

G, The ACROMION PROCESS.

H, The GLENOID CAVITY of the ſcapula.

I, The intervertebral ſubſtance of the fourth lumbar vertebra, counting from below.

MUSCLES.

K, The SUBCLAVIAN MUSCLE, reaching from the firſt rib to the clavicle.

L, The PECTORALIS MINOR MUSCLE, ariſing from the third, fourth and fifth ribs, and inſerted into the coracoid proceſs of the ſcapula.

M, The SERRATUS MAJOR ANTICUS, diſſected from its origin from the ribs, and left hanging at its inſertion into the baſis of the ſcapula.

Additional Pl.: VI.

Engraved by Mynd.

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Drawn by Chas. Bell

N, The fleſhy part of the DIAPHRAGM, where it ariſes from the ribs of the right ſide. The lower ſurface of the diaphragm is not ſeen, the cartilages of the ribs intervening from the obliquity of the view.

O, That part which is called the LIGAMENTUM ARCUATUM. The ligamentous nature of this arch is not readily ſeen; it is a mingling of tendinous-like fibres of the diaphragm, of the tranſverſalis abdominis, and quadratus lumborum muſcles.

P P, The central and tendinous part of the diaphragm, conſiſting of an irregular mixture of tendinous fibres ſurrounding the opening for the tranſmiſſion of the VENA CAVA.

Q Q, The LESSER MUSCLE of the DIAPHRAGM. It ariſes from the fore part of the body of the vertebræ by the ſheath of tendons called CRURA DIAPHRAGMATIS. Strong columns or faſciculi of muſcular fibres are ſeen to ſurround the aorta, to decuſſate, and again to ſeparate, for the tranſmiſſion of the œſophagus. This leſſer muſcle of the diaphragm expands or terminates in the central tendon which is marked P.

R, The hole for the PASSAGE of the INFERIOR CAVA.

S, The hole for the paſſage of the œſophagus.

T, The convexity of the diaphragm towards the thorax, ſeen through the intercoſtal ſpaces, the intercoſtal muſcles being taken away. By thus opening the thorax, the diaphragm falls flaccid, that degree of ſuction or vacuum which exiſted before, and kept it tenſe, ſo as to form a full arch riſing to a level with the rib, being deſtroyed.

ARTERIES.

1. The RIGHT CAROTID ARTERY, riſing from the cheſt.

2. The LEFT CAROTID ARTERY.

3. The LEFT SUBCLAVIAN ARTERY, where it comes out from under the clavicle and ſubclavian muſcle. At this point the attempt is made to compreſs the artery in operations about the ſhoulder-joint and axilla.

4 4 4. The INTERNAL MAMMARY ARTERY, ſeen in its courſe behind the cartilages of the ribs.

5. A more conſiderable branch riſing through the interſtices to ſupply the ſuperficial parts. Similar twigs are riſing, as the artery proceeds downwards, to ſupply the pectoral muſcle and the mamma in the female ſubject.

6. The THYROID ARTERY, riſing from the ſubclavian artery.

7. The THORACICA ACROMIALIS.

8. The great THORACIC ARTERY, or external mammary artery, raiſed up. Its natural place and appearance is ſeen in the Plates of the arm.

9. The SUBSCAPULAR ARTERY.

10. A THIRD THORACIC ARTERY. The others are very irregular.

11. The ARTICULAR ARTERY, a branch of the ſubſcapular.

12. The diviſion of the ſubſcapular artery.

13. The RIGHT PHRENIC ARTERY.

14. The LEFT PHRENIC ARTERY. Theſe form circles and inoſculations with each other, and with the internal mammary, and with the branches of the emulgent arteries.

15. The COELIAC ARTERY giving off its three great branches to the ſpleen, the ſtomach, and the liver.

16. The SUPERIOR MESENTERIC ARTERY.

17. The RIGHT EMULGENT ARTERY. 18. The LEFT EMULGENT ARTERY.

From this drawing, or in the ſubject at this ſtage of the diſſection, we ſee the conical ſhape of the whole thorax; each rib, as it is removed from the firſt, being the ſegment of a larger circle. We obſerve the extreme narrowneſs of the cheſt above, and that it is by the projection of the bones and muſcles of the ſhoulder that the appearance of breadth is given to the cheſt. So wounds paſſing aſlant the ribs, and through the pectoral muſcles and the ſhoulder, or into the axilla, ſhall appear to have

penetrated the ribs; the probe, while paſſing under the ſcapula or pectoral muſcles, may ſeem to be penetrating the cheſt.

The courſe of the internal mammary artery is apt to be forgotten by ſurgeons. It does not frequently diſturb him in practice, yet it is an important artery. Like the intercoſtal arteries, it is expoſed to injury from the fractures of the ribs or ſternum; and being much larger, the conſequences of ſuch injuries are more dangerous. The bones are deſtroyed, and the heart oppreſſed by the pouring of its blood into the anterior mediaſtinum.

We ſee alſo from this Plate how peculiar the riſing of the diaphragm is. In the middle part, at R, where the great veſſels are paſſing, and where it is connected with the mediaſtinum, or middle partition of the breaſt, it is fixed; but upon the great lateral portions is its greateſt latitude of action. From the riſing of the diaphragm into the thorax at T T, we ſee what was already mentioned, how frequently wounds muſt penetrate both the breaſt and belly, paſſing into the breaſt, and wounding the lungs, then perforating the diaphragm, and wounding the ſtomach or liver. In empyema, when there has been of courſe previous inflammation, or in the more common ſuppuration of the lungs, the cavity of the cheſt being diminiſhed, the diaphragm riſes higher, and coming in contact with the ribs, adheres to them; ſo that if the operation for empyema were to be performed at the point of election, the ſurgeon would find himſelf in the abdomen. I have lately ſeen a caſe of injury of the breaſt from wreſtling, where the fourth and fifth ribs had been broken; this was ſucceeded by a tedious illneſs, caries of the ribs, and extenſive ſinuſes under the integuments and pectoral muſcles. In this caſe, the propriety of making a free opening into the cheſt was ſuggeſted; but, upon diſſection, it appeared that the inflammation and ſuppuration had extended to the lungs, to the pericardium and heart; even the lungs were waſted, and the diaphragm adhered cloſely to the ribs; ſo that the firſt inciſion would have penetrated to the liver.

The patient, who is at preſent in the hoſpital, gored with a bull, gives us another example of the neceſſity of attending to the boundaries of the breaſt and belly. We ſee, that in the concavity of the diaphragm, there is lodged the moſt important viſcera of the belly, viz. the liver, ſtomach and ſpleen; ſo that the omentum and ſmall inteſtines covering the ſtomach and colon, preſent at the margin of the ribs oppoſite to the eighth rib. Now, in this caſe, the bull's horn paſſing into the belly on the left ſide, and turning up, ſtruck the margin of the ribs, tore them up, and hurt the lungs; but the elaſticity of theſe parts made the point of the horn ſlip off, and it again tore the integuments of the abdomen. At one of theſe openings, the jejunum hung out; at the other a great part of the omentum, and on the ſecond day there is emphyſema from the laceration of the lungs.

THIRD DISSECTION OF THE THORAX.

Of Opening the Thorax,—and of the Connections of the Heart, Lungs, and Inveſting Membranes.

To open the breaſt, the integuments are to be cut through in the length of the ſternum, and with the origin of the pectoral muſcle are to be diſſected back, until the joining of the cartilaginous and oſſeous part of the ribs is laid bare; which is obſervable by the difference of colour, the whiteneſs of the cartilage, and the livid or cineritious colour of the bony part of the rib. At this joining, the ribs, and the

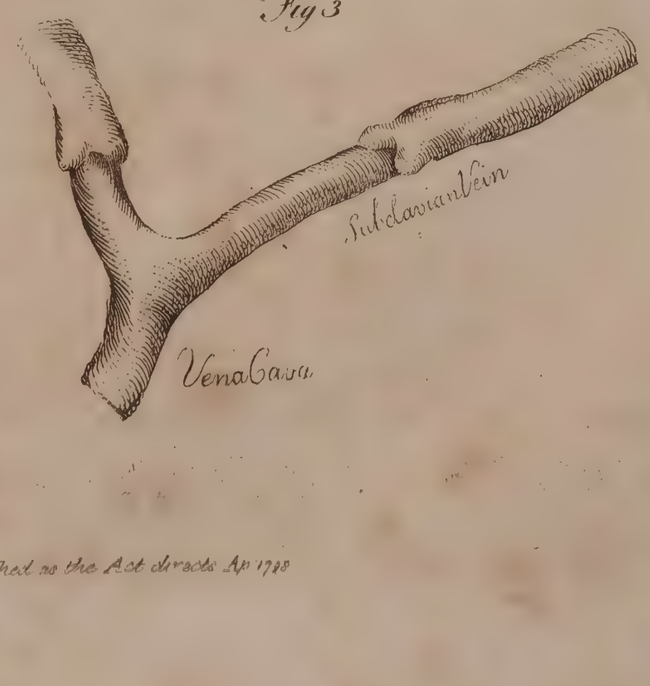
Fig 1

C Bell del

I Pedgo sc

Fig 2

Fig 3



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intercoſtal muſcles, are to be cut through; and the joint of the ſternum with the clavicle, being diſlocated, and the lower part of the ſternum ſeparated from the diaphragm, it is to be lifted upwards (as in Plate VI. fig. 1. a), or entirely removed. But if there is to be afterwards an injection of the veſſels in the breaſt, there will be a great deſtruction of ſmall branches of arteries, and much trouble in tying the internal mammary and intercoſtal arteries: in this caſe, therefore, it is better to ſaw through the ſternum at once, after the firſt inciſion, and violently to draw the divided ſternum aſunder; for by this the internal mammary arteries are preſerved—a great ornament to a preparation of the cheſt—and no arteries of importance are cut. In private diſſection, when the abdomen is to be opened, the inciſion may be continued down from the ſternum to the pubis: for the integuments in all this length, from the clavicle to the pubis, will ſtretch ſufficiently to lay open the viſcera of the belly in this one longitudinal cut.

When the ſternum is lifted, as in Plate VI. the anterior mediaſtinum (b b) is ſtretched betwixt the pericardium (c), which covers the heart, and the under ſurface of the ſternum (a); and it muſt be cut before the ſternum can be fully raiſed. On looking under the ſternum, when raiſing it, the mediaſtinum may be ſeen ſtretched, and (as it is gradually torn from the lower ſurface of the ſternum) ſeparating into two layers (b b), and forming a triangular cavity (d).—This is more evident in young ſubjects. This cavity, when the ſternum is let down again, is ſeen to cloſe by the elaſticity of the membrane. In children, the mediaſtinum, and all the membranes lining the cheſt, are more delicate and tranſparent; and when the ſternum is thus raiſed, in this cavity, which is artificially produced betwixt the layers of the mediaſtinum, the lowermoſt part of the thymus is ſeen. With little diſſection this gland may be diſplayed, ſtretching from the pericardium over the great veſſels which come from the heart, and its root connected with the lower thyroid veins *.

When the ſternum is laid back, the parts appear thus: The diviſion of the thorax into two diſtinct cavities by the mediaſtinum (b b)—the lungs of each ſide (e f g h i) lying diſtinct from each other in theſe cavities—and betwixt them the heart, obſcured by the pericardium (c); and the cellular membrane, which, before the ſternum was raiſed, formed the anterior mediaſtinum, is ſcarcely to be diſtinguiſhed upon the pericardium.—The mediaſtinum (b b), dividing the thorax, will in the ſubject be obſerved to run obliquely; for on the lower part of the ſternum, and near the diaphragm, it does not adhere to the middle of the ſternum, but is removed towards the left ſide, and is attached rather to the cartilaginous parts of the ribs than to the ſternum. This makes the right cavity of the cheſt larger than the other; and the difference is further increaſed by the heart (c) included in the pericardium and protruding from the mediaſtinum ſtill further into the left ſide.

The PLEURA is the membrane which lines both cavities of the cheſt; and as theſe cavities do not communicate, the pleura of each ſide is a diſtinct ſac; and, by their coaleſcing in the middle, they form the mediaſtinum. This diviſion of the thorax by the mediaſtinum keeps the lungs of one ſide independent of thoſe of the other—and the action of the reſpiratory muſcles will dilate the lungs of one ſide, although the cavity of the other ſide be laid open; and conſequently the lungs of that ſide fall collapſed and inactive. The inner ſurface of the pleura, where it lines the ribs, is denſe and ſmooth; but on the ſide attached to the ribs it gradually degenerates into the common cellular texture. Therefore, to divide the pleura into layers is not difficult: but ſtill the one layer will appear the common cellular ſubſtance, or the perioſteum of the ribs; while the other will be the ſmooth internal ſurface of the pleura.

If there be no preternatural adheſions of the lungs to the pleura where it lines the ribs, the general figure of the lungs is eaſily underſtood.—It will be ſeen, that the baſe of the lungs, or that part which reſts upon the diaphragm, is concave, anſwering to the convexity of the diaphragm; that they reach far

* It was once a favourite demonſtration to diſſect off the ribs and ſternum, and leave the pleura entire, and to blow up the cellular interſtice of the layers of the anterior mediaſtinum.

behind the diaphragm; and that they are pyramidal towards the upper part of the cheſt, anſwering to the pyramidal ſhape of the connected ribs.

The lungs of each ſide are ſubdivided into lobes. Thoſe of the right ſide generally into three (e f g) —two greater ones, and an intermediate leſſer lobe; and the left into two lobes (h i). This, however, is ſometimes reverſed. Theſe lobes are again divided into groups of cells; and theſe again into a ſeries of ſmaller veſicles, into which the air is admitted by the minute and leſs rigid branches of the trachea. Into the ſulci, forming the diviſions of the lungs into lobes, the delicate membrane inveſting the lungs is continued. Theſe clefts in the lungs cannot ſurely be for allowing them eaſy motion, in adapting themſelves to the form of the cheſt, or in embracing the heart with their prolonged points: For as there is no cavity in the cheſt before it is opened, and as the ſurface of the lungs is cloſely applied to the ſurrounding ſurfaces, there can be no room for motion in the ſides of theſe clefts upon each other. On the contrary, they muſt keep as cloſely in contact as if they adhered: nor can one lobe retract whilſt another ſwells up to fill its place, as in the inteſtines—the motion of the lungs not being cauſed by their own powers of contraction or dilatation, but by that mechaniſm which ſurrounds them, and which muſt apply equally to all the lobes at once. It is evident, that the pleura has the ſame relation to the lungs, and inner ſurface of the cheſt, that the peritoneum has to the inteſtines and inner ſurface of the abdominal muſcles; the pleura coſtalis being reflected at their root to form the pleura pulmonalis; the pleura will be found finer, and more compact in its ſtructure, than the peritoneum.

That the relative ſituation of all the parts, and the inflections of the pleura, may be correctly underſtood, they may be illuſtrated thus: In the middle of the breaſt lies the heart, with the great arteries and veins proceeding from it, and the trachea and œſophagus.—Theſe all lying betwixt the ſternum and ſpine, would form a diviſion of the breaſt independently of the mediaſtinum. The lungs, again, lie upon each ſide, connected by their arteries and veins, and the branches of the trachea. Now, ſuppoſe two bladders, one on each ſide of the thorax, placed betwixt the lobes of the lungs and the ribs; ſuppoſe alſo that theſe were to ſwell till their ſides inſinuated into every interſtice, and covered every projection; the ſides of theſe cyſts, having ſtretched over the ſurface of the lungs, would, if allowed to meet in the middle of the breaſt, form a partition, conſiſting of two layers of membranes. But where the heart and great veſſels intervene, the cyſts would not coaleſce, but would contain them in their duplicature. Near the fore part, under the ſternum, and before the heart, they would meet: and behind, again, near the ſpine, they would contain, betwixt their layers, the great veſſels running down the fore part of the vertebra; and as they came off from the ſpine over theſe veſſels, they would form a triangular ſpace, ſurrounding the œſophagus, aorta, vena ſine pari, and thoracic duct. Such, indeed, is the manner in which the anterior and poſterior mediaſtinum are formed by the two layers of the pleura. Only it will be obſerved, that in nature there is no actual coaleſcence of the pleura of each ſide to form the mediaſtinum, as the intervening heart and veſſels leave no interſtice for this union; unleſs the anterior mediaſtinum (b b) ſhall be conſidered in this light. But, to proceed with the illuſtration, ſuppoſing theſe bladders to be inſinuated betwixt the lungs, they would be ſtopped by the veſſels which go to the lungs from the heart; and ſurrounding them, they would form the LIGAMENTA PULMONUM. To carry the ſimilitude a little farther for the ſake of illuſtration, let us ſuppoſe, that the outer ſurface of theſe ſacs were to adhere, at one part, to the inſide of the ribs, and, following the curve of the inſide of the cheſt, to adhere alſo to the veſſels going to the lungs, and to the lungs themſelves, a lively idea of the real ſituation of the pleura may be obtained. For this membrane may actually be traced from the inſide of the ribs over the vertebræ of the back, and from the vertebræ over the lungs, and then reflected from the root of the lungs to the mediaſtinum.

When the breaſt is opened, the lungs collapſe, ſince they are kept diſtended only by that complete vacuum which is in the thorax. By collapſing, they loſe their natural ſituation, and retire from the ſide

Fig 1

Fig 2

Fig 3

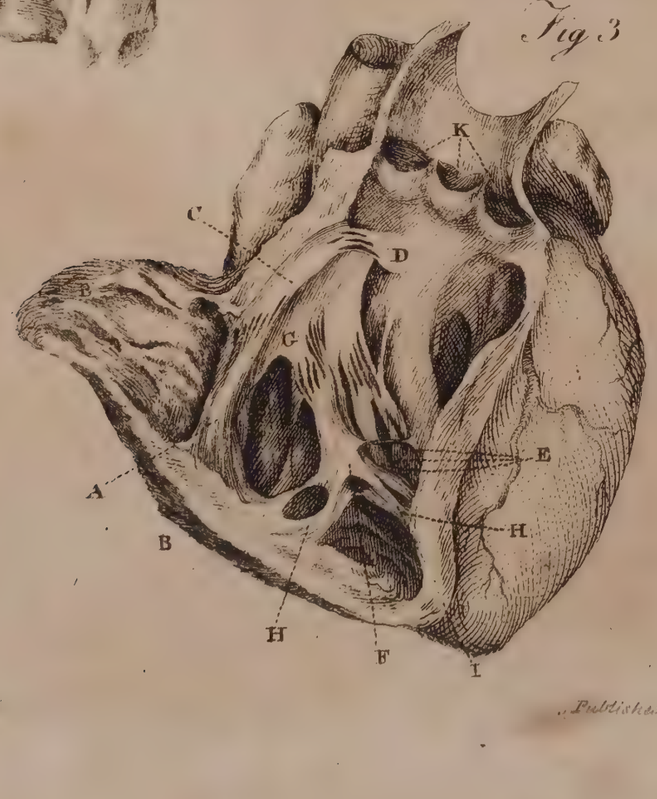
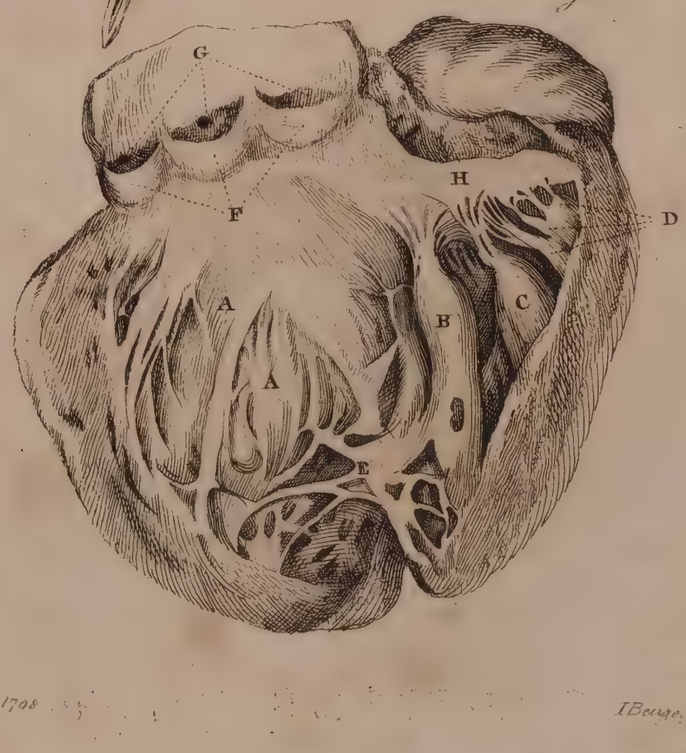


Fig 4

Fig 5



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of the pericardium. The heart, covered with its pericardium (c), is ſeen protruding its apex towards the left ſide, and puſhing the mediaſtinum, which covers the pericardium, before it. It is ſeated upon the diaphragm, to which (at k) the lower ſurface of the pericardium adheres, while the layer of the mediaſtinum is reflected off upon the diaphragm; and this layer can be diſſected from the pericardium in the young ſubject.

In this firſt view, the phrenic nerve (l) will be ſeen deſcending to the diaphragm upon the ſide of the pericardium, and turning over the apex of the heart. The veſſels which are ſeen upon the fore part of the pericardium belong to the ramus pericardio-diaphragmaticus of the mammary artery; and the larger branch which is ſeen accompanying the phrenic nerve is the ramus comes nervi diaphragmatici of the ſame mammary artery anaſtemoſing with a branch of the right phrenic artery.

The PERICARDIUM is a ſtrong white and compact membrane; ſmooth upon the inſide towards the heart; never adhering to the heart but in diſeaſe; and moiſtened with a continual exudation. It ſupports the heart in its place, allows it free motion in its natural play, and reſtrains it in its inordinate actions. When we lay open the pericardium (by ſlitting it up on the fore part), and expoſe the heart, the right ventricle (Plate VII. fig. 1. A.) protrudes; the right auricle (e) is towards us; the left auricle is retired, and its tip is ſeen lapping round upon the left ventricle: from under this tip of the left auricle, a branch of the coronary vein and artery (d) proceeds down to the apex of the heart. The courſe of theſe veſſels may ſerve as a mark of the diviſion of the ventricles by the ſeptum, by which the cavities of the heart may be laid open; for they run parallel to the diviſion of the two ventricles by the ſeptum, and a little to the left of that diviſion. If this mark, or the natural diviſion of the ventricles, be not ſufficiently diſtinct upon the outſide of the heart, by graſping the heart in the hand, the left ventricle will be found firm, fleſhy, and reſiſting; whilſt the right ventricle is looſe, and feels as if wrapped round the other. But theſe marks, by which the heart is to be diſſected, will be afterwards obſerved more particularly.

Following up the right ventricle to the root of the artery diſemboguing from it, we find the artery (Plate VII. fig. 1. a) betwixt the two extremities of the auricles; then it ſeems to turn entirely round under the arch of the aorta (b); but it ſends only the right pulmonic branch under the aorta, while the left (B) goes to the lungs of that ſide. The aorta (b), again, ſeems to riſe from the middle of the baſe of the heart, and takes a turn forwards from the left ventricle, which lies in a manner behind it.

Even in the uninjected ſtate of the heart, it can be obſerved how it is placed towards the left ſide of the cheſt, and how in its poſition, in regard to the ventricles, it is oblique too; as that ventricle which is called the right (A) is almoſt directly forward, whilſt the left (C) is behind, and almoſt completely hid by the right ventricle. It may alſo be ſeen how both ventricles reſt upon the diaphragm, making the lower ſurface flat, as if moulded by its own weight, and forming its obtuſe and acute margins; its point or apex being turned forwards, and towards the left ſide, ſo as to ſtrike its pulſation upon the joining of the cartilaginous and bony part of the fifth rib.

Holding the pericardium from the right auricle, the inferior cava (i) is ſeen coming up through the diaphragm, and the ſuperior cava (c) coming down from the upper angle of the pericardium, and behind that part of the aorta which is within the pericardium. A probe can be introduced behind the ſuperior cava; in which caſe, the probe will be inſinuated betwixt it and the veins going from the right lung to the left auricle. Upon lifting the heart from its place, and preſſing upon the back part of the pericardium, it aſtoniſhes us at firſt to find the back-bone projecting ſo far forwards, and reſiſting the finger. Theſe marks are very uſeful in examining the parts in diſeaſe. It is uſeful to obſerve the ſituation of the heart in the breaſt; becauſe, being held in the ſame poſition when it is taken out of the

body, the manner of laying it open can be ſimply deſcribed, and the deſcription of its diſeaſes eaſily underſtood.

In tracing the pericardium up to its connection with the great veſſels, it is found to be reflected from thoſe veſſels over the whole heart, and to form the outer covering of the ſubſtance of the heart. But here it is more delicate, and of a totally different nature from the proper pericardium. When this membrane which covers the heart is conſidered as the pericardium continued and prolonged, we are obliged again to explain its ſituation, when entire, by the awkward ſuppoſition of a ſac, emptied and laid upon the heart. In which caſe, the outward layer would repreſent the pericardium; and that which was in contact with the heart, the membrane of the heart itſelf. That the connections of the pericardium may be underſtood, it is only neceſſary to lay it open: but to demonſtrate it more completely, a tube and ſtop-cock may be introduced by a ſmall puncture, and the pericardium ſtrongly blown up: then the layers of the mediaſtinum may be diſſected a little off it, and the connections at the root of the great veſſels ſhown, with its veſſels, nerves, &c.

It may be obſerved, in regard to the pericardium, that the heart is never what we would call completely filled; that is to ſay, the ventricles and auricles are not diſtended at once; but the action of theſe alternating with one another, the pericardium, inſtead of being alternately diſtended and relaxed, muſt, in the regular actions of the heart, be much more ſtationary than we are at firſt aware of. So in injecting the heart, though the pericardium, being entire, may reſtrain the too great enlargement of the auricles or ventricles, yet it is no meaſure of the quantity of injection to be thrown in; and it can give no aſſurance of the heart being filled with its natural proportion of fluid; for either the quantity which belongs to two of the cavities of the heart may be divided among the four, or if all are filled to the utmoſt of their natural diſtention, the inveſting pericardium muſt be ſtretched beyond its due extent.

FOURTH DISSECTION.

Of Opening the Heart to Demonſtrate its Internal Structure;—and of Diſſecting the Coats of Arteries.

Supposing the heart to be rudely cut away, with its veſſels ſhort, and to be held nearly in the poſition in which it lies while in the body, theſe marks may be obſerved:

Firſt, The pulmonary artery (Plate VII. fig. 2. A.) is before the aorta (B); and theſe veſſels are in a direction croſſing each other. Secondly, Upon the left ſide of the pulmonary artery, the tip of the left auricle (C) appears; and under it a vein and artery (D), deſcending to the apex of the heart. Thirdly, The right auricle lies behind, and towards the right ſide of the aorta: a principal vein and artery (F) are ſeen emerging from the fat at the baſe of the ventricle, and under the margin of the auricle; they likewiſe run down to the apex of the heart. If the great arteries have been cut cloſe to the heart, the play of the ſemilunar valves may be obſerved by looking down into the veſſels, and raiſing the valves by blowing into them with the blow-pipe.

Of opening the right side of the heart.—To open the right ventricle, an incifion may be made from the root of the pulmonary artery (A) down to the apex of the heart, parallel with the right branch of the left coronary artery and its accompanying vein (D), which come out from under the left auricle, but a little to the right of thofe veffels (G G). By a cut made in this direction (care being taken to cut no deeper than the thin fides of this ventricle), none of the columnæ carneæ will be cut; for the ventricle will be opened exactly to one fide of the feptum of the heart: and being then enabled to fee what parts are to be cut, the incifion may be continued round the bafe of the heart, in the direction of the dotted line (H H), by the root of the pulmonic artery and margin of the right auricle: or the firft incifion (G G) may be continued round the point or apex of the heart, fo as to lay it open as if it were cleft or fplit from the apex.

The action of the femilunar valves of the pulmonary artery being examined from below, that artery may be flit up, and the infide of the right ventricle be difplayed, as in fig. 3.

Of the parts seen upon opening the right ventricle (Plate VII. fig. 3.).—Firft an irregular column of flefh (A) is feen rifing from that part of the ventricle which is laid back, and dividing into eight delicate cordæ tendineæ; and thefe are again expanded into a broad tendon (C), which is the anterior divifion of the tricufpid valve. From a little mammillary procefs of flefh (D), near the valves of the pulmonic artery, and where the furface of the ventricle is fmooth, there is fent out, in three divifions, a great number of delicate cordæ tendineæ; and which are alfo connected with this anterior divifion of the valve (C). The next divifion of the origins of the cordæ tendineæ is from the feptum of the two ventricles; from which they arife by feparate little pillars of flefh (E). And, again, from the backmoft part of the ventricle there is a ftrong pillar of flefh (F), having a double origin from the two oppofite fides of the ventricle, and to which the great pofterior divifion of the membranous valve is attached. The tranfverfe connections betwixt thefe mufcular attachments of the valves fhould be obferved. From thefe three divifions of this circle of membrane which furrounds the opening from the auricle into the ventricle, it is called the tricufpid valve. It muft be confidered rather as the ventricular valve of the right fide than as the valve of the auricle; in the fame way that the valve in the great artery is called the femilunar valve of the aorta.

The fmoothnefs of the ventricle towards the opening into the pulmonic artery may be obferved: and the pulmonic artery being flit up (as in fig. 3.), the three femilunar valves of this artery (K) will be feen. Thefe valves are more frequently perforated in the edges than thofe of the aorta.

Of opening the auricle.—A fmall part of the trunk of the vein fhould be left unopened; for when it is entirely flit up, it will not be always eafy to diftinguifh the mouth of the vein, nor, conſequently, the fituation of the parts as relative to the courfe of the blood.

To lay open the right auricle, introduce a probe or blow-pipe into the lower cava (fig. 2. I), carrying its point to the projecting part of the auricle at (K), which lies contiguous to the root of the aorta. Ufing this as a directory, the auricle may be flit up in the direction of the dotted line (fig. 2. IK); by which the Euftachian valve, and every important part, will be avoided. Continuing to hold the heart nearly in the fituation in which it lies while in the body, upon the flap (B, fig. 4.) which is laid toward the right fide of the heart, the remains of the foramen ovale may be feen (C D) in the partition dividing the two auricles. This foffa ovalis is an irregular depreffion, of an oval form, with its border (efpecially upon its upper part) elevated into a ring. It may be diftinguifhed by the difference of colour by which it is furrounded: its margin (D) is white, and has more the appearance of tendon. Within this there is a circle of thofe fleſhy fibres which form the musculi pectenati (I) of the auricle; and the membranous part in the middle, which performed the office of a valve in the

fœtus, is white and more callous, and being ſunk ſomewhat reſembles the tonſils in the throat. This membranous part (marked C, fig. 4.) ſeems continuous with the margin upon the lower part, while, upon the upper part it goes behind the margin of the foſſa: and here (exactly in the direction of the dotted line C, fig. 4.) it may be examined with the probe, if the valve be ſtill open, which it frequently is in children.

If the lower cava, where it expands into the auricle, be held open, or if the vein (I, fig. 2.) be ſlit up with the auricle (as it is in fig 4. E)—then, by extending the point (F) upon the left ſide of the vein, there will be ſeen a membrane ſtretching from the inner ſide of the margin of the foramen ovale, round upon that half of the root of the vein neareſt to the opening of the auricle into the ventricle.—This is the EUSTACHIAN VALVE (G): it is like the duplicature of the inner membrane of the auricle.

Behind the Euſtachian valve is the opening of the great coronary vein (H); which, running round the margin of the left auricle, gathers the ſmaller coronary veins. The little ſemilunar valve on the mouth of this vein was likewiſe firſt deſcribed by Euſtachius.—Several mouths of ſmall veins may be obſerved near it, and having all little pellucid valves covering their mouths.

When the auricle and ventricle of the right ſide are thus laid open, the play of the tricuſpid valve may be obſerved by holding out the auricle, and allowing the ventricle gradually to ſink in water, when the valves will riſe, and cloſe the opening into the ventricle.

OF OPENING THE LEFT SIDE OF THE HEART.—Introduce the blade of the ſciſſars into one of the pulmonic veins, and inſinuating it into the part of the auricle which projects by the ſides of the pulmonic artery (fig. 2. C), ſlit it up. Little is to be obſerved in this auricle: the MUSCULI PECTENATI are not ſo ſtrong nor ſo evident upon its inſide as thoſe of the right auricle. The PULMONIC VEINS open almoſt always in four mouths; thoſe from the right lungs being cloſer together than the left branches.

To expoſe the left ventricle, make an inciſion as far towards the left ſide of the vein which runs down from the tip of the left auricle to the apex, as the inciſion made to lay open the right ventricle was to the right of theſe veſſels. In opening this ventricle there is leſs fear of cutting upon the columnæ carneæ, or upon the ſeptum; as the right ventricle, being open, the ſeptum is ſeen, and we can cut immediately on the other ſide of it; while the columnæ are collected in the further ſide of the ventricle, round the opening of the auricle, and are not much expoſed to the knife (See B C D, fig. 5). Continuing the upper part of the inciſion round under the projecting auricle, ſlit up the aorta to ſhow its valves: in doing which, that branch of the left coronary artery which comes out under the margin of the left auricle (fig. 2. D) muſt be cut through. When this ventricle is laid open, that part which is towards the ſeptum is very little rugged with the interlacements of the columnæ carneæ, eſpecially towards the opening into the artery (A A). The fleſhy columns (B C D), on the contrary, which are connected with the mitral valve (H) (that valve which prevents the retrograde motion of the blood into the left auricle), are thick and ſhort, and confined in a corner of the ventricle; nor do they ſpread their roots ſo extenſively as thoſe of the right ventricle. Two larger maſſes of theſe muſcular columns, by which the valves are connected with the ſides of the ventricle, may be obſerved (B C). That which is before the other (B) may be cut from its root, and thrown back with the portion of the valve to which it is connected. In what reſpect this circle of valve reſembles a mitre, it is difficult to diſcover; but perhaps the more abſurd the names of parts in anatomy are, ſo much the better are they remembered.

The connections of theſe valves are ſo much alike in every eſſential circumſtance to thoſe of the right ventricle, that a deſcription of the effect of the contraction of the muſcular columns will apply equally well to both.

Turning our attention to the ſemilunar or figmoid valves, we may obſerve, that in the child they are delicate and looſely floating membranes, variegated in part by a white opacity; while their edges are at ſome places ſo tranſparent, that there appears often to be real deficiencies of the valve near the edge, when there is none:—It however happens not unfrequently that ſuch deficiencies really do exiſt. In the adult, theſe valves acquire greater firmneſs and ſtrength, and are opaque. Behind each of the valves are ſeen the LESSER SINUSES OF THE AORTA (fig. 5. G).

The uſe of thoſe cavities behind the valves has been often conſidered, but not ſatisfactorily explained: they ſeem to be intended to prevent the poſſibility of the valve being forced againſt the ſides of the artery by the ejection of the blood from the ventricle. If no ſuch proviſion were made, the blood would, upon the reaction of the artery, have no power upon them to throw them down upon the ventricle. But by this ſinus or cavity behind each of the valves, they are held as if in the middle of the ſtream of the retrograde blood; and in its firſt movement backwards, they are forced together ſo as to prevent the regurgitation of the blood into the ventricle. The mouths of the coronary arteries (I, fig. 5.) open behind the two valves which are upon that ſide of the aorta, contiguous to the pulmonary artery.

It is diſputed whether theſe ſemilunar valves affect the paſſage of the blood into the coronary artery. But though the valves were thrown ſo cloſe upon the ſides of the aorta as to cloſe the mouths of the coronary arteries during the ſyſtol of the heart, ſtill that quantity of blood, which is behind the valve upon its being thrown back, would as effectually be propelled into the coronary arteries as if no valve intervened.

See, below, Diſeaſes of the Heart.

OF THE ACTION OF THE TRICUSPID AND MITRAL VALVES;—AND OF THE EFFECT OF THE CONNECTIONS OF THE COLUMNÆ CARNEÆ.

THE diſputes and variety of opinions about the action of the tricuſpid and mitral valves have ariſen from the ſuppoſition, that the columnæ carneæ were merely the attachments of the cordæ tendineæ to the fleſh of the ventricles. And, upon this ſuppoſition of their inactivity, the whole attention was beſtowed upon the contraction of the ventricle, and the approaching or retiring of the apex of the heart from its baſe during its action. Nor does it ſeem ever to have been conſidered what is the peculiar connection of the roots of the columnæ carneæ to the parietes of the ventricles, or what effect the dilatation of the cavities of the heart muſt conſequently have upon them.

But ſince thoſe connections of the membranous valves of the auricle are only in part tendinous, while much of their length is muſcular (viz. the columnæ carneæ), it is natural to ſuppoſe, that thoſe muſcular columns are ſynchronous in their action with the ſides of the heart itſelf, with which they are intimately blended. While the action of the auricle is dilating the ventricle, and the cavity of the ventricle is diſtending in every direction, the cordæ tendineæ will be ſtretched, and the attached muſcular columns will be relaxed, while the heart itſelf is relaxing. And it may be obſerved, that in whatever direction the ventricle is dilated (whether in its tranſverſe or longitudinal diameter), the connections of the little muſcles attached to the valves are ſuch, that they muſt be extended and relaxed.

Again, during the contraction of the ventricle, the columns of Lower contracting alſo (the muſcular fibres of both having been excited by the diſtention of the ventricle) as the apex of the heart approaches the baſe (or the opening of the auricle into the ventricle) to which the valve is attached, the cordæ tendineæ are ſhortened by the contraction of their muſcular attachments:—and by this means

the valves are reſtrained from being inverted, and the blood from eſcaping backwards into the auricle from the contracting ventricle.

This explanation of the action of the columnæ carneæ does not reſt upon the preſumption of the elongation of the heart in its axis; which is a diſputed point.—For if the connection of theſe little muſcular columns be attended to, it will appear, that their elongation and relaxation muſt take place during the filling of the heart with blood, in whatever direction the ventricle is dilated by the influx of blood. For inſtance, in the right ventricle, the larger pillars connected with the valves have their baſe riſing from the three oppoſite ſides of the heart; and the leſſer columns run in a direction acroſs the cavity of the heart,—or croſs bridles may be obſerved, which, being fixed into the longitudinal columns, muſt elongate their fibres upon the dilatation of the ventricle in width. And it may be obſerved, that by the contraction of the fleſhy roots of the chief columnæ (as at H H, fig. 3.) they have a greater combined effect upon the point (F), or pull it through a greater ſpace, in a middle courſe directly in the axis of the heart, than if the column of muſcle attached to the valve ran in a direct courſe from the valve (G) to the apex of the heart (I). And it will readily be conceived, that the relaxation of the muſcular power in theſe decuſſating fibres of the columnæ carneæ, will allow an equal latitude to the lengthening of the cordæ tendineæ (inverſely as their powers of contraction), when the heart is dilating by the influx of blood from the contracting auricle.

It will be at once underſtood, how very imperfectly experiments, by filling the dead heart with water, will illuſtrate the play of the valves in the living body.

OF THE DISSECTION OF THE COATS OF ARTERIES.

To prepare the coats of an artery neatly, it ſhould be injected with coloured tallow, and its coats diſſected and pinned out; or the diſſected coats threaded with a ſtrong briſtle, to keep them ſeparate. —It is then to be preſerved in ſpirits. To ſhow its inner ſurface, it may be opened, the injection picked from its cavity, and its ſides held ſeparate, as in Plate IX. fig. 5. and 6. Even where we have to examine diſeaſes (as in aneuriſms, in oſſifications of the coats of the arteries of the extremities, in ſtumps after amputation, or in diſeaſed lungs, &c.), a cautious injection will not injure the diſeaſed appearances in the cavity of the veſſels, while it has the advantage of enabling us more eaſily to trace the blood-veſſels in diſſection, and to examine more accurately their connections with nerves or diſeaſed parts. And the whole artery, if filled with injection, preſerves, when diſſected out and prepared, an intelligible ſhape, as in Plate I. fig. 6.

For the manner of demonſtrating the muſcularity of arteries, I muſt refer to the Introduction, p. xii.

There are, ſtrictly ſpeaking, only four coats in an artery;—the outer cellular coat—the muſcular coat—the inner cellular coat—and that coat which forms the inner ſurface of the artery. To diſſect the more numerous diviſions of the coats, as deſcribed by ſome authors, the chief dependence muſt be placed upon the outer cellular coat; for this coat may be ſeparated into layers making up any number of coats, while the others are more diſtinct, with ſomething like a natural diviſion between them.

THE EXTERNAL CELLULAR OR VASCULAR COAT, (fig. v. 1.).—By this coat the artery is connected with the parts in which it lies imbedded. It is covered in the great cavities by the general inveſting membrane, as the pleura or peritoneum. The ſmall arteries which ramify upon the larger trunks of arteries (the VASA VASORUM) run chiefly in this external coat.—Theſe arteries are not, in general, derived from the larger veſſels on which they lie, but come from ſome of the ſurrounding ſmaller branches of

arteries. They are to the great arteries as the coronary arteries are to the heart.—They ſupply and nouriſh the coats of the arteries, while the column of blood in their cavities ſeems to have no reciprocal action with the ſides of the great arteries. To prepare theſe ſubordinate veſſels, they muſt be injected minutely (while they lie in ſitu) with ſize, or fine varniſh injection, of a light colour, or of pure white. If after this minute injection a coarſer and dark coloured injection be thrown into the trunks, the light coloured and fine injection will be puſhed onward, while the coarſe injection fills only the trunks; making thus a contraſt between the large veſſels and the ramifications of the vaſa vaſorum upon its ſurface. The artery, when thus injected and prepared, may be dried and varniſhed, or preſerved in ſpirits.

The outer cellular coat of an artery may be ſeparated into many layers.—In fig. v. 1. 2. it is ſeparated into two; on the other ſide into three layers (3). Theſe layers are gradually, as they proceed inwards, changed in their nature from that of the general inveſting cellular membrane, and are at laſt incorporated into a more regular coat, which has been called the tendinous coat (fig. v. 2.). It may be uſeful to obſerve, that it is this coat, according to Haller, upon which depends the tortuous ſhape of arteries; and that which has been hinted at, viz. that while its inner ſurface, contiguous to the muſcular coat, is more accurately defined, its outer ſurface ſeems imperceptibly to degenerate into the nature of cellular ſubſtance. The common cellular ſubſtance, which ſurrounds the arteries looſely more or leſs through the whole body, forms ſheaths, which, in the diſſection of ſome parts, it is neceſſary to preſerve. Of this kind is the ſheath which ſurrounds the carotid artery, jugular vein, and eighth pair of nerves, in the neck. It is very neceſſary often to ſhow the ſituation of veſſels in regard to the bed of cellular ſubſtance and fat in which they lie. Indeed nothing is of more conſequence to the ſurgeon; for if we are taught the anatomy of accurately diſſected muſcles only, and of injected veſſels cleared from all confuſion, we can ſcarcely hope to recogniſe an artery in an operation on the living body. In a demonſtration, therefore, if the ſtudents have not ſeen the whole progreſs of the diſſection, ſome part of the artery ſhould be left in its native confuſion.

The CARTILAGINOUS, TENDINOUS, or PROPER CELLULAR COAT, then, of an artery, is the inner layer of this firſt coat, which has now been conſidered in its greater latitude. It is certainly a more appropriated coat, but outwardly it is undefined. To the ſtate of the ſecretions in theſe cellular coats, have been attributed all kind of diſeaſes of the arteries. "If the oil in the cells be too thin, or only lymph be contained, "the muſcular coat may be too much relaxed: If there be too ſmall a quantity of the moiſtening li-"quor, the artery loſes the flexibility neceſſary for its action; and if the morbid matter become acrid, it "will deſtroy the muſcular coat." Theſe are very unlike the words of a man who wrote with the knife in his hand; the effect of doctrines which did not become celebrated from the elegance of the theory, but by the laborious inveſtigation of the ſupporters of that ſchool. It ſhows us, that obſervation and good practical inferences will be received, even though clogged with a weak theory.

The MUSCULAR COAT.—Having diſſected theſe outer layers, the muſcular coat (Plate IX. fig. v. 3.) appears. Its fibres run in circles round the artery; no fibres run in the length of the artery. The circular fibres of the muſcular coat are imperfect.—On attempting to trace any ſingle fibre, it will not be found to make a complete circle round the artery; but the circle is made up of ſegments of fibres irregularly combined, the extremities of which are intermixed, and ſeem loſt among each other.

The INNER CELLULAR COAT.—In diſſecting a diſeaſed artery, with concretions formed in its coats, the concretions are, upon lifting the muſcular fibres, found ſituated in the INNER CELLULAR COAT; if indeed

it deſerves the name of a coat, ſince it is rather a connecting medium betwixt the muſcular and the innermoſt coat of all. This inner cellular coat is difficult to be demonſtrated ;—but by ſlitting up the artery, and tearing off its innermoſt coat (fig. v. 4.), the exiſtence of this one may be ſhown ; it appears alſo in the oſſified ſtate of the artery, when the concretions are ſeen under the muſcular coat upon the outſide, and adhering to the innermoſt coat upon the inſide. In a recent and healthy veſſel, there is great difficulty in diſſecting or tearing off this inner coat, unleſs a degree of putrefaction have taken place.

FIFTH DISSECTION OF THE THORAX.

Of the Injection and Diſſection of the Heart and adjacent Veſſels.

Old ſubjects ſhould never be taken for the purpoſe of preparing any of the viſcera : for the fat is in old age peculiarly accumulated about the viſcera, both of the abdomen and of the thorax. Nor is the fat depoſited here derived from the extremities ; for although the limbs of old people ſeem, during life, ſhrivelled and lean, yet the oil contained in them makes them alſo uſeleſs for preparing :—although dried with the utmoſt care, they ſweat out greaſy matter, which mix with and diſſolves the varniſh ; and they never make clean nor laſting preparations. If the heart, therefore, has much fat accumulated about it, there ſhould be no heſitation in ſacrificing it, as a preparation to the attainment of ſome other point of inquiry, as the examination of its internal ſtructure, &c.

To make a good injection of the heart, it is neceſſary to have the coagula well waſhed from its cavities ; to have it warm and moiſt ; and to pay particular attention to the filling of the coronary veſſels, upon which the beauty of the preparation much depends. The coronary veins, and even the arteries, may be injected ſeparately, by introducing a long tube down the cava and aorta ; or the fine injection may be thrown in in this manner ; while they are filled with the coarſe injection, at the ſame time that the cavities of the heart are injected. By this means the ſurface of the heart is beautiful, the minute ramifications of theſe veſſels being filled with colours anſwering to the colour of the injection in the right and left ſides of the heart. The right ſide of the heart will be moſt advantageouſly injected from the left jugular vein, or the injection may be made by any of the other large veins. From any of theſe the right auricle and ventricle, with the pulmonary artery and coronary vein, will be filled. The left ſide of the heart may be injected from the aorta below the diaphragm, or from the axillary or carotid arteries of either ſide. By this injection all the arteries of the breaſt will be injected ; the coronary arteries ; the left ventricle (by the wax breaking down the valves of the aorta) ;—and from the ventricle the wax will find its way into the left auricle, and into the pulmonary veins. If in filling the heart the injection, by flowing down upon the veſſels in a full ſtream, ſhould raiſe the valves, either in the aorta or in its paſſage into the auricle from the ventricle, the valves may, by kneading or irregularly compreſſing the heart, be moved from their hold, and the injection have acceſs to the whole ſide of the heart : but to prevent the poſſibility of the valves of the aorta being ſhut by the injection, they may be lacerated by introducing a probe down the aorta ; or a tube may be introduced into one of the pulmonary veins,—though this will be ſeldom neceſſary. The knowledge of the diſtribution of the veſſels will teach us how careful we muſt be to tie all the leſſer branches of the aorta and the veins previouſly to injection. In injecting the veins, the vena cava may be tied above the diaphragm, or it may be tied below the liver, by which the venæ cavæ hepaticæ will be filled.

The THORACIC DUCT may alſo be injected.—If ſought for in the abdomen, it will be diſcovered at its dilated part (Plate VII. fig. 1. v.) at the root of the myſenteric veſſels; or upon the left ſide of the aorta (at t), as one of its branches runs under the aorta; it is then ſeen going up under the diaphragm, alongſt with the aorta, and upon its right ſide, cloſe to the ſpine (s). In the thorax, it may be diſcovered running up betwixt the aorta and vena-ſine-pari. If it lie collapſed and undiſtinguiſhable, it may be raiſed by blowing into ſome of the glands upon the root of the myſentery, or into thoſe upon the courſe of the external iliac veſſels, or even into thoſe without Poupart's ligament in the groin. It muſt be injected with a different colour from the veins, that it may not be confounded, in the thorax and at the root of the neck, with the branches of the veins.

In injecting the heart when out of the body, the numerous branches of the ſubclavian arteries and veins, and the intercoſtal arteries coming off in the whole length of the aorta, muſt be tied. And to make ſure that all veſſels are tied, except thoſe into which the tubes muſt be introduced, let the heart and lungs be laid in a flat baſon, and covered with water; then, by blowing into the principal trunks, all the open mouths of arteries will be eaſily detected.

OF THE VESSELS TO BE TRACED IN THIS DISSECTION.

In the firſt place, the pericardium being diſſected off, all is made clear for the diſſection of the heart and great veſſels:—Then the fat which obſcures the coronary veſſels is to be diſſected away;—the great coronary vein is to be ſhown encircling the baſe of the heart, and emptying itſelf into the right auricle:—The right and left coronary arteries are alſo to be diſplayed; they need little diſſection, but upon the baſe of the heart.

In diſſecting betwixt the aorta and pulmonary artery, there may be obſerved a kind of ligament between them, which is the remains of the DUCTUS ARTERIOSUS. The branching of the pulmonic artery (Plate VII. fig. 1. a.) to the lungs of each ſide being diſſected, and the right branch followed under the arch of the aorta, and the branches of this artery, and the pulmonic veins, diſplayed for ſome way ramifying in the lungs—we muſt proceed with the aorta (b), as it riſes from the heart, where it is called the aſcending aorta. In young ſubjects, the THYMUS muſt be attended to: it is to be lifted from the pericardium and great veſſels, and folded over upon the neck. Its blood-veſſels will be found coming out from the root of the internal mammary artery of each ſide, and attached to the thyroid or tracheal veins. Upon the top, or utmoſt convexity of the aorta, three important branches (x y z) are ſent off towards the right ſide: the arteria innominata (marked x) quickly divides into the right ſubclavian and right carotid arteries; the middle branch (y) is the carotid of the left ſide; the other (z) is the ſubclavian artery of the ſame ſide.

But the SUPERIOR VENA CAVA (C), and the trunk (E), common to the jugular and ſubclavian veins of the left ſide, croſs before theſe important arteries. The ſuperior vena cava, ſhooting up from the right auricle, and having eſcaped from the pericardium, is joined upon its back part by the VENA AZYGOS. This vein coming forward in an arch from the ſpine, upon which it creeps to one ſide of the aorta, and before the intercoſtal arteries, it pours its blood, gathered from the back part of the cheſt, into the ſuperior current of blood. The vena cava, having got a little higher than the arch of the aorto, ſtretches a great arm (the left ſubclavian vein) (E) acroſs the top of the cheſt, and before the root of the arteries which go to the head and arms. This branch, dividing into the internal jugular and the ſubclavian

veins, receives the blood from the left ſide of the head and neck and from the left arm: and at the angle formed by the joining of the internal jugular and ſubclavian veins of this ſide, the THORACIC DUCT (D) empties itſelf into the circulating ſyſtem.

OF THE LESSER VEINS.—The VENA MAMMARIA INTERNA of the right ſide comes off from the upper part of the ſuperior vena cava, where it is about to divide. Upon the left ſide, it comes off from the ſubclavian vein, oppoſite to the cartilage of the firſt rib. The DIAPHRAGMATICA SUPERIOR, or PERICARDIO-DIAPHRAGMATICA, on the right ſide, joins the vena cava at its bifurcation; on the left it joins the ſubclavian below the mammaria. The THYMICA, on the right ſide, ſometimes joins the vena cava; ſometimes the gutturalis or thyroid vein, or ſome neighbouring branch: on the left ſide it empties itſelf into the ſubclavian vein. The RIGHT PERICARDIAC VEIN enters the root of the right ſubclavian vein: on the left ſide it joins the ſubclavian vein, or the diaphragmatica, or the mammaria interna. The THYROID VEIN, or TRACHEALIS, or GUTTURALIS, of the right ſide, is inſerted into the bifurcation of the vena cava: on the left ſide, into the upper and back part of the left ſubclavian. The diſtribution of theſe veins is deſcribed in their names. It is for the moſt part very regular; but their communications with the larger veins are very inconſtant, and differ in each ſide as the great trunks are different. There is little uſe for a minute knowledge of theſe veſſels, unleſs that we may be able to tie them in injections *.

OF THE LESSER ARTERIES.—The SUBCLAVIAN ARTERY is the great ſource of the numerous ſmaller arteries which ramify in the thorax, upon the mediaſtinum and pericardium, and upon the under ſurface of the ſternum; and of thoſe alſo which ſeem to come out from the thorax to be diſtributed upon the root of the neck and ſhoulder.

1ſt, The INTERNAL MAMMARY ARTERY of the right ſide is the firſt branch which the ſubclavian artery of the right ſide gives off after parting with the carotid. It is ſeen running upon the inſide of the cartilages of the ribs near the ſternum: It ſupplies much of the contents of the thorax anteriorly; and inoſculates with the epigaſtric branch of the fœmoral artery upon the abdominal muſcles.—It gives off the ARTERIÆ THYMICÆ, it ſends branches through the ribs to the muſcles and integuments.

2d, The INFERIOR THYROID ARTERY is the ſecond branch of the ſubclavian artery, and is ſubdivided into theſe branches: The RAMUS THYROIDEUS—the RAMUS TRANSVERSUS COLLI—the RAMUS THYROIDEÆ ABSCENDENS—the TRANSVERSALIS SCAPULARIS, which, however, is as commonly the third branch of the ſubclavian, under the name of SUPRA SCAPULAR ARTERY.

4thly, The VERTEBRAL ARTERY, going from behind the ſubclavian artery, enters the vertebral hole of the ſixth vertebra of the neck.

5thly, The CERVICALIS PROFUNDA—and,

6thly, The CERVICALIS SUPERFICIALIS.

Theſe two laſt are, however, frequently ſupplied by the wide ſpreading branches of the thyroid artery: and indeed we muſt reckon ourſelves very fortunate in diſſection, when we can furniſh branches for thoſe numerous names.

7thly, The SUPERIOR INTERCOSTAL ARTERY, with its accompanying vein, can ſcarcely be diſſected while the contents of the cheſt are in their place, as it lies cloſe to the joining of the upper ribs with the ſpine, and comes from the back part of the ſubclavian artery.

* As the right auricle of the heart lies upon the diaphragm, the inferior vena cava muſt be very ſhort. If the VENA AZYGOS had emptied itſelf into the vena cava at this place, it muſt have climbed upon the diaphragm, and been affected by its alternate action, and muſt have joined the cava within the pericardium. It follows the general courſe of the veins of the thorax, which go to terminate in the branches of the ſuperior vena cava, where there is more eaſy acceſs to them.

All theſe arteries will be more accurately told in the diſſections of the neck and arm; and plans will be given to facilitate the explanation.

In preparing for the diſſection of theſe veſſels, the reader may obſerve the general diſtribution of the nerves, and mark the points at which they are complicated with the arteries and veins, in the Second Part of Vol. II.; where the diſſection and general courſe of theſe nerves are treated of, from the baſe of the ſkull through the neck, thorax and abdomen.

To continue the diſſection of the aorta, as it lies upon the ſpine deep in the cheſt, the lungs, and even the heart, would need to be taken away, to have a full demonſtration of its branches, which are but few and inſignificant. But by folding back the lungs from one ſide of the cheſt, any thing important may be ſufficiently obſerved. In tracing the aorta as it goes down upon the ſpine, the following are the chief branches: The BRONCHIAL arteries are ſent off to the root of the lungs, three or four in number, for nouriſhing the proper ſubſtance of the lungs. The OESOPHAGEAL arteries are ſent off in ſmall twigs to the œſophagus, as the aorta paſſes parallel to it in the poſterior mediaſtinum: And ſmall arteries are ſeen coming off from the aorta, at regular intervals as it proceeds downwards; and running into the interſtices of the ribs, they proceed along a groove in the lower edge of each rib.—Theſe are the INTERCOSTAL arteries, and are accompaneid by branches from the vena azygos.

EXPLANATION OF PLATE VI.

The ſternum raiſed, and the viſcera of the thorax, ſeen in their natural ſituation.—a a, The under ſurface of the ſternum, from which the anterior mediaſtinum is torn in lifting it—b b, The mediaſtinum ſeparating into two layers as it is torn from the ſternum, and thus forming a kind of triangular cavity d.—c, The heart covered by the pericardium—e f g, The anterior middle and poſterior lobes of the lungs of the right ſide—h i, The anterior and poſterior lobes of the left ſide—k, The diaphragm pulled up from the liver (which is in outline) by the raiſing of the ſternum—l, The phrenic nerve attached to the pericardium.

FIG. 2. Shows the ſhape of the valve of the jugular vein, and the dilatation of the vein above it.

FIG. 3.—The ſuperior cava and ſubclavian vein, much contracted, in a child.

EXPLANATION OF PLATE VII.

In the firſt figure of this plate, the heart and lungs are ſeen in the ſame poſture as in Plate VI. only the pericardium and diaphragm are taken away. The heart is ſeen inclined to the left ſide—The right ventricle A, is forward—The left C, is behind—The coronary artery and vein (d) mark their diviſion—a, Is the pulmonic artery—b, The aorta—c, The ſuperior cava—i, Marks the very ſhort trunk of the vena cava, common to the vena cava hepatica and vena cava abdominalis h.—e, Is the right auricle.

The lungs need no references.—The ſubclavian vein of the left ſide is marked E, as it paſſes before the branches of the aorta—x, Is the right ſubclavian artery—y, the carotid of the left ſide—z, The ſubclavian artery of the left ſide. The aorta, turning round the pulmonary artery and trachea, gains the ſpine, and runs down upon its fore part. It is ſeen again as it is about to enter the abdomen; and here it gives off the phrenic arteries. The cœliac artery is marked l—The ſuperior meſenteric artery m—The inferior meſenteric artery n—o, Is the emulgent artery of the right ſide—p, The emulgent artery of the left ſide—q r, The emulgent veins—s t v, The thoracic duct, which is ſeen here running up by the ſide of the aorta, and appears again at d, where it terminates in the angle betwixt the left jugular and ſubclavian veins.

Figure 2d, 3d, 4th, 5th, are explained in page 44. 45.

GENERAL VIEW OF THE ACTION OF THE VASCULAR SYSTEM, AND OF THE ACTION OF THE DIAPHRAGM AS AFFECTING THE HEART;—BEING INTRODUCTORY TO THE DISEASES OF THE HEART AND VESSELS.

There are a few leading points in the action of the vaſcular ſyſtem, which being acknowledged and kept in view, will enable us to examine with advantage the morbid appearances in the heart and adjacent veſſels; or their preternatural ſtructure, as in monſters, or in the imperfect animals. And as the appearances which we have to expect in morbid diſſection are perpetually varying, to proceed at once to a detail of thoſe appearances, without ſettling the principles upon which our eſtimation of their importance is to be formed, muſt expoſe us to continual difficulties.

It is neceſſary to recollect the ſituation of the heart in relation to the ſurrounding parts, and to conſider how its motions are regulated.

When the diaphragm, which divides the thorax from the abdomen, is pulled down, and the thorax is expanded, and the lungs conſequently dilated, it is natural to inquire, What effect this expanſion will have upon the heart, or at leaſt upon the great veins and auricles? As they lie within the ſame cavity with the lungs, they alſo would be dilated, or their action in ſome meaſure affected, by the vacuum * thus formed in the thorax, were there not a particular mechaniſm to counteract it. By the connection of the mediaſtinum with the heart, by its reaching to the upper part of the thorax and ſurrounding the great veſſels, and by its being ſtretched over the pericardium, or rather intimately connected with it, and forming its outer coat—it embraces the whole circulating powers in the thorax. By this means the heart is ſo ſituated, that the effects of that dilatation of the cavities, by which the lungs are dilated, is counteracted in its operation upon the heart and veſſels:—for the mediaſtinum, being connected firmly with the diaphragm, the diaphragm contracts only upon its lateral parts, while its efforts upon the mediaſtinum muſt pull the membranes cloſer about the heart, in proportion to the increaſe of capacity of the thorax, and to the tendency which the heart would otherwiſe have, in conſequence of that increaſe, to dilate. This may ſerve as ſome explanation of the heavings of the cheſt, when, by violent exerciſe, or in any other way, the blood is ſent into the right ſide of the heart in increaſed quantity; for while an

* It will not be underſtood that I mean here a ſeparation betwixt the lungs and the inſide of the thorax and an actual vacuum, but ſimply the tendency which the dilatation of the thorax has to expand any cyſt whoſe cavities can be filled from ſources external to the thorax; as the lungs, by the atmoſpheric air drawn through the trachea.

increaſe of velocity in the circulation of the blood requires a proportional increaſe in the action of the lungs, the compreſſion of the heart and veſſels, when the diaphragm acts ſtrongly upon the mediaſtinum and pericardium, makes us inſtinctively ſtruggle to procure the neceſſary dilatation rather by the expanſion of the ribs than by the action of the diaphragm. If the lungs are thus dilated by the expanſion of the thorax, then the diaphragm does not need to be ſo violently contracted, and conſequently the pericardium and mediaſtinum do not ſo ſtrongly compreſs the heart, veins, and right ſinus. An increaſe of the velocity of the blood in circulation muſt be accompanied with a proportional increaſed action in the lungs, becauſe this increaſe of the quantity or velocity of the blood paſſing through the heart, is an increaſe of its ſtimulus, which muſt be accompanied with a proportional increaſe of the power of action or irritability; the ſource of which is in the lungs, and which, through the medium of the blood, is beſtowed upon the heart. Were not the heart thus invigorated to greater action, an increaſed flow of blood through it would exhauſt its powers, and a load of blood be forced into its cavities, which it would be unable to propel forward; as happens in experiments upon the lungs of animals when the artificial breathing is ſtopped *.

But to return, this mechaniſm in the thorax brings the great veſſels in the breaſt more to a balance with thoſe in the belly, and other parts of the body.

Upon examining the ſituation and connection of the ſuperior and inferior cava, it is evident that they are not ſo large, in proportion to the arteries, as the veins in other parts of the body are; and that the blood muſt conſequently paſs through them with greater force or celerity, ſince the diameter of the veins, compared with that of the arteries, muſt be the meaſurement of the comparative force with which the blood paſſes through them. At the bottom of the jugular veins, and at the mouth of the axillary or ſubclavian veins †, we find valves placed, which defend them, as they enter the thorax, againſt the regurgitation of the blood from the cheſt into the upper extremities and head, when the contents of the cheſt may (in conſequence of any irregular action peculiar to the reſpiratory organs, as coughing or ſneezing) be under ſeverer preſſure than the veins in the extremities ‡. That it is not to prevent the back ſtroke of the auricle that theſe veins are guarded by valves, we may preſume; ſince there are no valves guarding the pulmonic veins from the action of the left auricle, and ſince there are no valves in the lower

* It is ſaid, that the blood, as a local ſtimulus, could not produce that regularity which the heart has in health, nor that irregularity which we find in diſeaſe. But the blood affects the heart in two ways;—firſt, by ſtimulating it to exertion, in conſequence of the mere diſtention of its cavities;—and, again, by beſtowing upon it, in its circulation through the coronary veſſels (as in every other part of the body), life and the principle of activity. For when blood unventilated, unimpregnated with new properties (or whatever action the lungs produce upon it), gets acceſs to the coronary veſſels, it more quickly diſſipates the energy of the heart than if the heart were allowed to exhauſt itſelf, deprived of all circulation. It is of conſequence to obſerve the appearance of the blood circulating in the coronary veſſels, in experiments upon the action of the heart in living animals. This is not a matter foreign to the preſent ſubject; it is impoſſible to account for the way in which the blood is found diſtributed in the ſyſtem after death without conſidering it.

† In Plate VI. there are two etchings of the veins at this part. Fig. 2d ſhows the natural dilatation of the internal jugular vein above the valve. Are we to conſider this dilatation in the great veins of the neck as a proviſion againſt congeſtion in the head from any irregularity in the circulation of the cheſt, and as admitting a kind of depoſit here of that blood which would ſtill more ſubject the head to the load of repelled blood during violent coughing, &c.? In violent fits of coughing, the contents of the breaſt are under violent compreſſion during the convulſive expiration; but preparatory to that convulſive expiration, and after it, the maſtoid muſcle is in violent action as a muſcle dilating the cheſt, the head being fixed, and muſt compreſs this dilated vein which lies immediately under it; and as the blood in the vien cannot enter the head again, it is forced into the ſuperior cava. See further of the veins of the abdomen in this action, note §§, next page.

‡ In diſſecting ſubjects in which there are enlargements of the heart, or where palpitations of the viens of the neck have formed a ſymptom of this diſeaſe, and where the pericardium is found dilated, &c.;—it is of conſequence to examine the ſtate of relaxation of the diaphragm, the valves of the veins in the neck, the valves in the heart, and the general relaxed ſtate of the membranes in the thorax, as explaining the ſymptoms of the diſeaſe during life.

cava. This laſt circumſtance ſuggeſts to us the probability, that in every irregular motion in the action of reſpiration, the compreſſion upon the veſſels is the ſame in the abdomen as in the thorax; for if there were a poſſibility of a greater compreſſion in the thorax by any voluntary exertion of the body, or irregularity of reſpiration, the lower cava would have been defended likewiſe with valves. And it will appear, from a review of the action of the abdominal muſcles and diaphragm, that the veins in the thorax and abdomen do in all actions ſuffer like degrees of compreſſion. Let it be conſidered for a moment, what would be the conſequence upon the viſcera of the abdomen, if, during a fit of coughing, their veſſels were liable to as violent diſtenſion as we ſometimes ſee in thoſe of the face. That the compreſſion upon the veſſels of the thorax, and upon thoſe of the abdomen, is the ſame, will further appear from this conſideration, that when the abdominal muſcles act ſtrongly, the diaphragm yields, which prevents the greater compreſſion of the abdominal viſcera. On the contrary, when the diaphragm reacts and reſiſts, then the force reſiſting (viz. the diaphragm) being equal to the force firſt exerted by the action of the abdominal muſcles, it follows, that the portion of the cava which is in the thorax is as ſtrictly compreſſed by the mediaſtinum as the cava in the lower belly is by the abdominal muſcles. Again, if the diaphragm acting ſhould be ſuppoſed to compreſs the veſſels round the heart, it muſt be remembered, that its contraction pulls ſtrongly upon its origin, or inſertion, only according the reſiſtance which its action meets with: and as the mediaſtinum may almoſt be conſidered as the inſertion of this muſcle, if the abdominal muſcles do not react, the mediaſtinum cannot be ſtrongly compreſſed, and the abdominal muſcles when they do react compreſs the lower cava with an equivalent force.

If the preſſure were not equal in the breaſt and in the belly, but greater in the breaſt, then would the blood be occaſionally repelled from the breaſt, and accumulated in the abdomen §§.

It comes next to be conſidered, What is the power which dilates the auricle; and what is the conſequence of the action of the auricle upon the column of blood in the veins! The great uſe of the auricle is, to prevent the action of the ventricle upon the circle of blood contained in the veſſels from propelling the blood round upon the ventricle, even whilſt yet in its ſtate of contraction. For when the ventricle contracts, it throws forward into the veins a quantity of blood beſides what dilates the arteries; and a portion of the column of blood in the veins neareſt the heart is conſequently driven forward and fills the auricle *. That the dilatation of the arteries is not ſufficient to account for the quantity of blood ſent out by the contraction of the ventricle, is apparent from the flow of blood being continued in the veins during the contraction of the heart and dilatation of the arteries:—and that quantity of blood which is more than ſufficient to dilate the arteries and continues to flow into the veins, would, it is evident, diſtend the ſides of the veins, were not the auricle at this time relaxed ſo as to allow an eaſy exit from the veins of this addition to their column of blood. This free exit to the venal blood, in the direction of the axis of the veins, prevents an additional lateral preſſure.

§§ In violent coughing, ſtraining, ſneezing, &c. wherever, in ſhort, the thoracic and abdominal muſcles are exerted, ſtagnation is ſaid to be produced in the veins near the thorax. This, it may be obſerved, can never be brought directly to the teſt of experiment, unleſs in the veins of the neck; becauſe theſe actions cannot be produced when the breaſt of an animal is laid open. The opinion has ariſen from ſeeing people coughing violently with the face turgid with blood; but this is cauſed by the difference of compreſſion in the thorax, and in the head and arms, and does not prove that there is any difference of compreſſion in the belly and in the breaſt. And the greater turgidity of the face to that of the arms is probably occaſioned, partly by the action of the muſcles of the neck (chiefly by that of the platyſma myoides, which covers the external jugular vein, and is in violent ſpaſmodic-like contraction during violent coughing), and partly becauſe any dilatation of the veſſels of the head muſt be external only.

* In examining monſters, and in diſſecting the more imperfect animals, the great principle which muſt keep the blood in an uninterrupted circulation ought to be remembered, viz. the alternate action and relaxation of the muſcular fibres of the arteries; their elaſtic power being only ſubſervient in reſiſting, and in throwing the contraction of one ſet of muſcular fibres upon that which is to follow, that it may be dilated, and again in its turn react. An artery cannot circulate the blood either in a monſter or a worm without ſome part of the circle alternating with it in action and relaxation.

It is perhaps more difficult to explain why there is not a regurgitation of the blood, or dilatation of the veins, upon the reaction of the auricle. For though the force and quantity of the blood ſent from the ventricle be ſo much more than ſufficient to keep the veins dilated to their ſtationary diameter as to dilate the auricle alſo, there is ſtill to be accounted for that portion of the blood delivered by the ventricle, which was ſufficient to fill the arteries, and which continues to be forced on during the contraction of the auricle.

The queſtion comes ſimply to this, At what time, or by what power, does this quantity of blood, which is ſent out by the ventricle, and which is more than ſufficient to dilate the auricle, and ſtimulate it to contraction, return to the ventricle? Does the blood, even during the contraction of the auricle, ſtill force itſelf onward by the effort of the arteries to contract, not in oppoſition to the contracting auricle, but acting, in aid of the auricle, to diſtend the relaxed ventricle? Or does the quantity of blood, which is by the contraction of the arteries propelled into the veins, diſtend the veins through the whole body during the contraction of the auricle, and when the blood may be ſtopped from entering the heart? The firſt of theſe ſeems to be the truth;—becauſe, by ſuppoſing the contraction of the arteries ſtill to carry forward the column of blood in the veins ſo as to flow through the auricle into the relaxing ventricle, the whole quantity of blood ſent out from the ventricle is accounted for without any pauſe or ſtop in the whole circulation †. This ſeems to agree the beſt with our obſervations on living animals: and it accounts for the lateral preſſure of blood upon the ſides of the veins being at all times equal. And if the combined power of the arteries cannot force a portion of the column of blood, equal to their contraction, into the ventricle during the contraction of the auricle, then not only muſt it be allowed that the contraction of the auricle is ſtronger than that of the arteries, but that it is ſo even when its whole ſide is as if opened by the relaxation of the ventricle. It is evident, then, that the relaxed ventricle is the only oppoſition to the flow of the blood from the veins into the heart during the contraction of the auricle. Were we to account for the quantity of blood ſent out by the ventricle, by ſuppoſing a dilatation of the veins to take place, we muſt allow a ſtoppage, or retrograde movement, in the great veins, which is contrary to the facts every day before us; and beſides, this ſuppoſed dilatation of the veins (which may be imperceptible, being ſo ſmall a quantity of blood diffuſed over the whole body), muſt be accompanied by a greater compreſſion upon the blood of the veins at one time than at another; which ſhould be eaſily obſerved.

But the conſideration which puts this queſtion of the action of the veins in its trueſt light, is this: The power of an artery is great in proportion to its length; and this increaſe of power, which the artery gains as it recedes from the heart, is thus exactly proportioned to the diſtance through which it has to propel the blood back by the veins. In this way all the veins (whether the coronary vein of the heart, or the cava of the body) pour their blood with an equal force into the auricle. An action of the veins, on the contrary, would not be thus counteracted; but the blood would flow to the heart with unequal force, according to the length of the vein which acted upon it.

It may be well to conſider, how very ſmall any dilatation of the veins, occaſioned by ſuch an inſufficient cauſe as is generally aſſigned, muſt be; and the inveſtigation will at the ſame time take away from

† From obſervations on the heart's motions in living animals, when influenced by artificial breathing, Mr. Hunter concludes, "That "the auricles are only reſervoirs, capable of holding a much larger quantity than is neceſſary for filling the ventricles at one time, in "order that the ventricles may always have blood ready to fill them." This is the opinion which is careleſsly adopted in all books in which any explanation is given of this. But it is perfectly clear, that ſince there is a quantity of blood ſent out from the ventricles ſufficient to dilate the arteries as well as the auricle, there muſt, upon the relaxation of the ventricle and action of the auricle, be a quantity of blood equal to that which dilated the veſſels returned into the ventricle, beſides what is ſupplied by the auricle; and the contraction of the auricle cannot from its own ſtores ſufficiently dilate the ventricle, without there being in the next round of actions a deficiency of blood ſent by the auricle into the ventricle.

the ſupport which might be derived to the above opinion from the obſervations of thoſe who have ſeen even violent pulſation in the veins, and conceived it to be occaſioned by the action of the ventricle, and to be ſynchronous with the pulſation of the arteries *. The pulſation in the arteries is occaſioned by the whole quantity of blood ſent through them, in the direction of their axis, lengthening them, in oppoſition to their elaſticity, and cauſing them to form contortions or curves. This is well illuſtrated in the pulſation of the heart; which is in fact the pulſation of the aorta, not of the heart, and is cauſed by the effort of the aorta to lengthen itſelf, and to form a more direct line, carrying the heart as on its point. It is illuſtrated alſo by the contortions of the arteries of living animals; as in the membranes of the chick in ovo, by the pulſating bud of an artery when tied in our operations:—and it gains additional proof from conſidering the very ſmall dilatation which an artery muſt ſuffer in any one point touched by the finger, though the dilatation of the whole taken together is conſiderable. It is not, therefore, the degree of dilatation, which we feel in the pulſe, but the ſhock given to the column of blood by the action of the ventricle. Before adopting the opinion, then, that the reaction of the arteries ſhould perceptibly dilate the veins, or convey a pulſation to them, it muſt be remembered, that the veins, either during the contraction of the heart, or during that of the arteries, do not receive the impulſe of the ſame quantity of blood which gives the pulſation to the arteries; but if they ſhould be ſuppoſed to dilate during the contraction of the arteries, they receive only that which is ſpent in the dilatation of the arteries; and if they are ſuppoſed to be dilated during the contraction of the heart, then are they dilated by the blood ſent from the ventricle, which remains after the dilatation both of the arteries and auricle. To all this muſt be added the very great difference of capacity of the veins and arteries;—we muſt conſider that many veins of a greater ſize accompany a ſingle artery in the extremities; and how immenſe the capacity of the veins is in many parts of the body; as the ſinuſes of the head, the great veins in the neck, abdomen, and pelvis. How little effect that quantity of blood which dilates an artery (in a degree imperceptible to the ſight) ſhould have, when thus diſperſed in the greater capacity of thoſe veins, which is triple, or even quadruple that of their accompanying arteries, muſt be at once acknowledged.

But further, a pulſation, ſuppoſed to be tranſmitted to the veins, would differ from that given to the arteries, in this—The pulſation of the arteries is great near the heart, becauſe their elaſtic reſiſtance is great, and the force of the current of blood ſent forth from the heart is propelled violently in a narrow channel: and the elaſtic reſiſtance of thoſe greater arteries throws the force of the blood forwards unexpended into the ſmaller arteries, which have a leſs degree of reſiſting elaſticity, and a diameter (the caliber of their branches being taken collectively) infinitely greater than the trunks:—and as thoſe branches have, as they recede from the heart, an additional muſcular force in proportion to the loſs of their elaſtic reſiſtance, which muſcular power is then in a ſtate of relaxation, that portion of the blood which is expended upon the dilatation of the arteries, is beſtowed upon their extremities chiefly; and the extreme arteries again react by their muſcular power, in exact proportion to their degree of dilatation—and thus they become the moſt active agents in the circulation. But if the great arteries near the heart were di-

* Mr. Hunter ſays, "I think I have ſeen the difference of the projection ſo great, that it hardly could ariſe from that cauſe alone;" viz. the lateral dilatation of the accompanying arteries.—And he adds, "The large veins near the heart have a pulſation, which "ariſes from the contraction of the heart preventing the entrance of the blood at that time, and producing a ſtagnation. This I ſaw "in a dog," &c. The inconſiſtency of this is evident. He finds a dilatation of the veins ſynchronous with the dilatation of the arteries, viz. by the contraction of the ventricle: and, again, when they ſhould unload themſelves of this blood which dilates them, they are precluded by the action of the heart preventing the entrance of the blood, and forming a ſtagnation. And in oppoſition to both theſe obſervations, he ſays in the ſame page, that in ſome fevers the arteries contract, and the veins dilate alternately. Having an unſettled wavering opinion, he makes obſervations in direct contradiction. All obſervations in experiments upon the dilatation of the vena cava near the heart, the effect of artificial breathing on the action of the heart, and ſtagnation of the blood by expiration, are inaccurate;—for by the opening of the breaſt the whole actions in the thorax muſt be completely deranged.

latable in a great degree, it would retard the circulation; becauſe the force of the ventricle would be expended upon their dilatation where there was no need for it, ſince the dilatation is a proviſion for an additional muſcular power, to be exerted in accelerating the motion of the blood. We ſee, then, that the arteries dilate as they proceed; that they form a cone with its apex in the heart; that the blood muſt move more ſlowly onward in the extremities; and that it loſes in a proportional degree its impulſe from the heart. The effect of the contraction of the arteries, then, upon the veins, differs from that of the heart upon the ateries, in this, that the effort of the heart is accumulated to a point, and the whole blood of the body is propelled through a narrow channel; that the contraction of the extremities of the arteries, on the other hand, although great when taken in its combined effect, yet being diffuſed over the whole body, and the action upon the veins being through their innumerable extremities, and the quantity of blood returned by the veins, during the impulſe of the heart, not being equal to that which paſſes through the aorta, the blood in its paſſage through the veins cannot have the ſame effect in cauſing a pulſation with the current of blood through the aorta.

Thoſe who conceive that there is a pulſation in the veins, and who argue from what they have obſerved of the beating of the veins, or the leaping of the blood from them when punctured, as from an artery, beſides overlooking the effect of the alternate action of the heart and arteries (ſee p. 28.), do not ſeem to have conſidered what effect this great degree of action in the veins of the whole body would have, upon their inſertion into the right ſide of the heart: for perceptibly to dilate the veins, would take a quantity of blood greater than is ſufficient to dilate the auricle; while, by their account, this pulſation is occaſioned by the ſame power which cauſes the pulſation of the arteries, viz. the ventricle. Now this is the ſame with ſaying, that the contraction of the right ventricle of the heart dilates the arteries, dilates the veins, and fills the auricle; and in this ſtate the quantity of blood delivered from the heart is left, without accounting for the manner in which an equal quantity of blood with that which fills the arteries and veins returns to the ventricle from which it was propelled. When are the veins ſuppoſed in this caſe to be emptied? It muſt be during the contraction, not only of the auricle when the exit of the blood is more difficult, or, as the greateſt ſupporters of this opinion ſay, is abſolutely ſtopped; but alſo during the contraction of the arteries upon the other extremity of the veins, which probably produces a greater effect upon them than even the action of the heart, which is more remote.

The moſt eſſential difference between the veins and arteries conſiſts in the different velocity of their blood. The quantity of blood under the active influence of the heart and arteries, at the ſame moment, is amazingly ſmall, compared with that in the veins: but in any length of time, the quantity paſſing through the arteries will be equal to that paſſing through the veins; for the veins have the blood ſlowly moving in their large cavities, while in the arteries it is ſent quickly through their narrow channels. The blood in the veins approaching the heart, is received as into a vortex, puſhed in an inſtant through the right ſide of the heart, driven through the circulation of the lungs, has its properties invigorated, and in an inſtant is ſent through the whole body, comes in contact with the parts upon which it is to act, is again depoſited in the veins, where for a time it lies inactive, or ſluggiſhly moving through their dilated cavities. If it were not for this diſtribution, and if the heart and arteries could not draw ſupplies from the more inert maſs of blood in the veins, our lives would be ſtill more liable to every accident, and a trifling loſs of blood would be fatal. It may be of importance to conſider, as connected with the animal economy, from what proceeds, or to what tends, the increaſed quantity of blood in the dilated veins of old people, and whether it correſponds with the diminiſhed velocity of the pulſe, &c.

From the nature of the ſubject, this account may appear prolix or confuſed. In the apparent ſimplicity of the heart's motions, there muſt be many actions in uniſon with each other, while yet in deſcription it is difficult to convey an idea of the accuracy with which every action is adapted to that which

is to follow. But it may be uſeful, in concluding this ſubject, to give a ſhort recapitulation of the mutual action of the heart and blood-veſſels.

The contraction of the ventricle delivers into the artery a maſs of blood, which quickly pervades the rigid trunks, and is ſent into the more pliant muſcular extremities, which are then in relaxation. Theſe arteries dilate through their whole length, but chiefly in their ſmall branches. Beſides the quantity of blood dilating thoſe arteries, there is enough ſent from the ventricle of the heart to continue the propulſion of the blood into the veins, which, diſplacing a proportional quantity from thoſe veins which lie near the heart, propels it into the auricle, and dilates it. By this means the auricle is dilating during the contraction of the ventricle: again, upon the relaxation of the ventricle from its action, the flow of blood is continued into the veins by another power, viz. the contraction of the arteries. By this contraction, the quantity of blood ſent out by the laſt pulſation, more than was ſufficient to fill the auricle, is continued forward with great force; a force as great as that exerted by the auricle: it conſequently enters the relaxed ventricle alongſt with that blood which is ſent in by the contracting auricle; and ſo a maſs of blood, equal to that ſent out by the laſt pulſation of the heart, is ſent again into the ventricle. The flow of the blood through the inoſculating branches of the arteries and veins (which muſt be conſidered as the ultimate intention of the circulation) is ſlow and uniform, allowing a reciprocal action betwixt the fluids and ſolids; and is yet ſent to the heart in ſuch a manner, that the alternate action of the muſcular power, the efficient cauſe of the circulation, is at one time allowed relaxation, and is at another ſtimulated to action.

See peculiarities in the Veſſels of the Extremities, in the next Part, containing the Diſſections of the Thigh, &c.

OF THE APPEARANCES OF DISEASE IN THE CIRCULATING SYSTEM.

Although, during life, the heart ſeems the moſt frequent ſeat of diſeaſe, the moſt diſtreſſing ſymptoms, and all the feelings of miſery and oppreſſion, ſeeming to be concentrated there; yet organic diſeaſes, or ſuch derangement of the natural ſtructure as comes under examination in the dead body, are far from being common. This is to be aſcribed to the more lively ſenſibility of the heart, and its ſtrict dependence upon the reciprocal actions of the whole ſyſtem: ſo that while the feeling of diſeaſe in the heart is common almoſt to a neceſſity in every more univerſal diſeaſe, its organic derangements are comparatively few.

OF THE APPEARANCE OF DISEASE IN THE COATS OF BLOOD-VESSELS.

Both arteries and veins are liable to have concretions formed in their coats; but in the veins it is an uncommon diſeaſe, and, apparently, the concretions are different in every reſpect from thoſe found in the coats of arteries. Concretions in the arteries have been long a ſubject of inquiry; and it is one which indeed involves much matter of practical importance in its diſcuſſion.

The INNER CELLULAR COAT is generally the ſeat of diſeaſe in the arteries. It is the ſeat of oſſifications, or more properly concretions. Steatomatous tumours, alſo, I have obſerved originating in the cellular ſubſtance, behind the inner coat of the aorta, and partially filling up the artery. The aorta has been totally obliterated, and the circulation carried on by the inoſculation of the thoracic and epigaſtric arte-

ries, by the inoſculations betwixt the phrenic, and cœliac, and meſenteric arteries. Before we can conceive, that the minute branches of theſe extended arteries could perform the circulation of the blood through the pelvis, and thighs, and legs, we muſt recollect, how ſlowly ſuch obſtruction approaches, and how unlike the inſtantaneous obſtruction in the tying of arteries.

Pus is deſcribed by ſome authors as found in this internal cellular membrane; but it is more probable, that it was that kind of matter which ſurrounds the concretions.

Of Concretions.—Puſhed on by the ſucceſs of ſome experiments upon the generation of bone, I applied with keenneſs to every opportunity of examining morbid concretions in the coats of arteries; and although I came to no new concluſions with regard to their formation, I was confirmed in the opinion that, in accounting for dilatations in arteries, too much importance has been given to concretions, while the general ſtate of the artery has been overlooked; and that concretions are more of the nature of an accompanying evil; and only one of many forms which diſeaſed arteries aſſume. Theſe concretions are ſituated betwixt the inner membranes of arteries and their muſcular coat. They are of two kinds. More generally, they appear upon the inſide of the artery, yellow and irregularly concreted tubercles; and upon the injection and drying of the artery, they raiſe its ſurface into irregularities, as in Plate IX. fig. I. It is in this ſtate, that, upon opening them, they are frequently found ſurrounded with matter, thick, and of the ſame colour with the concretions. This led Haller to the explanation, that theſe oſſifications, as they are commonly called, are concreted from a fluid matter depoſited; in oppoſition to the opinion, that the matter is formed in the ſurrounding coats by the irritation of this foreign ſubſtance cauſing ulceration. Were this fluid matter produced by ulceration, we could not conceive that the artery ſhould be able to ſuſtain the force of the blood for an inſtant, or what limits ſhould be ſet to the ulceration. Theſe opacities are often ſeen without any concretion.

This matter ſurrounding the concretions was obſerved by the older anatomiſts; but was conſidered rather as a circumſtance confirming them in their opinion of the concretions being true bone; for this they conſidered as the marrow.

In the broad ſcales, which more reſemble bone, this fluid matter is ſeldomer found. Such broad ſcales are frequently found almoſt completely ſurrounding the artery (as in Plate IX. fig. VII. and V.), without any dilatation or aneuriſmal enlargement of the artery; while the more irregular tubercles are common in the enlarged arteries, as in fig. I.

Rupture, from the ſcales formed in the coats of arteries, happens very ſeldom in the great arteries of the trunk. From the caſes on record, it would appear, that the fair rupture of the aorta takes place more frequently within the pericardium, and at the root of the heart.

It is wonderful that the larger trunks of arteries, where they lie in an even courſe, are ſometimes ſurrounded with ſcales of theſe concretions, while yet they ſeem to perform their functions. In fig. III. we have an example of a ſcale taken from the bifurcation of the aorta; which, from having been allowed to dry, appears here more intimately blended with the coats of the veſſel than it really was. Oſſifications in the lower part of the aorta are very frequent without dilatation. In fig. V. 4. many very broad ſcales are ſeen in the femoral artery, without any dilatation; and alſo in fig. VII. which is a remarkable oſſification of the ſplenic artery. Theſe inſtances would alone teach us how paſſive the great trunks of arteries are, compared with the extreme branches.

Of the cause of aneurisms.—In aneuriſms of the great arteries, the coats are found thickened, firm, and eaſily ſeparating into layers, almoſt conſtantly with concretions formed in them, and with their elaſticity always remarkably diminiſhed. Theſe oſſifications have been always aſſigned as the cauſe of enlargements of the arteries; but the degree of the enlargement, and its place in the artery, do not ſeem

affected by the offifications. If theſe offifications cauſed the enlargement of the artery, by acting mechanically by attrition and deſtruction of its coats, they would produce, not a gradual and extenſive enlargement, but a partial and ſudden one; ſuch as we find in the extremities. It has been ſaid, that the offifications in the coats of arteries occaſion greater reſiſtance to the dilatation cauſed by the action of the ventricle of the heart; and that this reſiſtance exciting the heart to greater action, it becomes at laſt ſo great as forcibly to dilate the artery.—A ſtrange ſubtilty, to make the ſtrength of the artery the cauſe of its being overpowered. It is ſaid again, that theſe offifications deſtroy the muſcular coat of the artery; and, conſequently, rendering it incapable of withſtanding the ſtroke of the heart, it ceaſes to ſecond the ſtroke of the heart, and ſuffers itſelf to be dilated. But the muſcular coat of an artery is not that which reſiſts the paſſage of the blood, or rather the dilatation occaſioned by the force of the ventricle; the muſcular coat is alternate in its action with the heart. During the contraction of the heart it is in relaxation; and it is only when the heart intermits its action that the muſcularity of the greater arteries acts in reſiſtance to the muſcularity of the extremities; whoſe combined power would repel the blood back to the trunks, and dilate them, were the greater trunks not enabled to reſiſt by the additional action of their muſcular power. The great power of reſiſtance in the arteries near the heart to the blood propelled from the ventricle, is their elaſticity. This is a power which yields, yet reſiſts. By its yielding, and yet its uniform increaſing reſiſtance even to the utmoſt ſtretch of its elaſticity, it ſubdues that ſhock which the great veſſels would otherwiſe receive from the ſudden exertion of the heart. Upon diſſecting the coats of dilated arteries, it is apparent, that the whole functions of the veſſel muſt be impaired; the coats are thickened; are eaſily diviſible; and have loſt their elaſticity. And upon examining the length of the aorta, when thus diſeaſed, it is found dilated; not uniformly where the offifications are moſt numerous or longeſt, but often where there are no hardenings or concretions in the coats. On the other hand, whole tracts of offification will be found without any dilatation of the artery. In this ſtate, the arteries can no longer dilate upon the action of the heart, and uniformly reſiſt and contract again; but, on the contrary, there is a more ſolid and inert reſiſtance to the impulſe of the heart, their coats being thick and unelaſtic: ſo that every contraction of the heart gains a point in the dilatation of the artery, which (unlike the dilatation of elaſticity), is never regained. Thus, although the artery be actually ſtrong in its coats, and dilated and filled with firm coagula of blood, yet will the impulſe of the heart gradually encroach upon this inert reſiſtance.

Cause of dilatations being more frequent in the curvatures of arteries.—The arteries are more generally dilated at their curvatures, or where branches are ſent off. The reaſon of this is evident, if we allow the above explanation of the cauſe of dilatation in general. Thoſe who have paid minute attention to the ſtructure of arteries, have found, that where an artery ſends off a branch, or takes a ſudden turn, its coats are ſtrengthened to reſiſt the action of the blood, which muſt be greater at theſe points: and as this increaſe of ſtrength muſt conſiſt in a more powerful elaſtic and pliant reſiſtance to the current of blood propelled by the heart, combined with ſuch a proportion of muſcular power as to react equally with the reſt of the canal; ſo when the coats of the artery become diſeaſed, they bring the artery to the ſtate of a rigid tube; and, conſequently, the force of the heart becomes more quickly perceptible at thoſe points which are moſt expoſed to the current of the blood, and where that power which formerly reſiſted in a greater degree is now reduced to the ſame ſtate of inactivity with the reſt of the tube. Thus we find dilatations more frequent in the curvature of the aorta, at the root of the great veſſels going to the head and arms; and in the belly, at the cœliac, and emulgent, and meſenteric arteries.

Of aneurisms in the extremities.—This explanation of the cauſe of dilatation may be extended to the aneuriſms of the arteries in the extremities; where we almoſt conſtantly find the enlargement of the

artery at the part where it lies in the great joints, as in the groin or ham. But in the aneuriſms of the extremities there is often another cauſe of dilatation, which ariſes from the mechanical effect of the concretions in the coats. In diſſecting the tumor of the artery, it is frequently found, not to be a uniform dilatation of the coats of the veſſel, but the artery is ſeen upon one ſide of the tumor*, and reſembles that aneuriſm which is formed by the puncture of the veſſel, and by the blood eſcaping from it into the ſurrounding ſoft parts, and forming a ſac. Wherever I have had an opportunity of examining the artery, it was much oſſified and diſeaſed above the tumor; a circumſtance always to be dreaded in attempting the operation when it is an aneuriſm of the dilated coats.

Theſe concretions in the coats form gradually; and they adapt themſelves to the ſhape of the artery in the prevailing poſture of the limb. If the leg be for the moſt part ſtiff and rigidly extended, upon any violent exertion the artery is bent, and its coats torn upon the edges of theſe concretions. On the other hand, if the limb be ſhrunk up and contracted, the artery being at the ſame time diſeaſed in much of its extent, may have formed a ſcaly concretion in a curve anſwering to the bend of the artery at the joint, as in the ham or groin; and in this caſe a violent attempt to ſtretch the leg will have the ſame effect, ſince it muſt bring the artery to an angle differing from that of the ſcale which has been formed in its coats, and ſo rupture it. There are caſes of this kind upon record.

More particularly of the great aneurisms in the breast.—While ſlight dilatations are very frequent in the aorta, as it proceeds from the heart, and in its great arch, it is univerſally obſerved, that dilatation of the pulmonic artery is very rare. When the dilatation of the aorta has proceeded a certain length, it rapidly increaſes. The drawing of the aorta which is given in Plate IX. fig. I. may be conſidered as the firſt ſtage of its dilatation, and is a common appearance. It ſeldom happens that the artery is in this condition near the heart, without being in ſome degree enlarged through the whole length of the aorta. Aneuriſm never is in its commencement a local diſeaſe. But when the dilatation of the artery has proceeded thus far, it generally at ſome one point gives way more eaſily; ſo that the dilated ſides of the artery are puſhed towards the root of the neck, or being forced directly forward in the cheſt, come in contact with the ſternum. The bone for ſome time interrupts its progreſs: but by the continued impulſe from the heart, the coats of the artery ſeem to be worn away in the pulſation againſt the bone; while, on the other hand, the perioſteum and membranes which cover the bone are entirely deſtroyed, and the bone itſelf becomes carious. Or ſometimes the dilated ſac of the artery, ſtretching widely under the ſternum, finds a leſs reſiſting paſſage betwixt the cartilages of the ribs, deſtroys their membranes, and, protruding, raiſes a beating tumor externally upon the breaſt. When this happens, there are generally two tumors; the tumor of the one ſide appears before that of the other, and commonly they riſe upon each ſide of the ſternum, about a hand's-breadth below the clavicle.

To examine the ſtate of the parts, we may proceed thus: Diſſecting off the integuments from the breaſt in the uſual way, they may be laid back until the tumors on each ſide of the ſternum are completely laid bare. But it may happen, that when the dilatation has proceeded freely in this direction, the ſkin (if it have not actually burſt) is ſtretched and inflamed, and has become as it were one ſubſtance with the ſides of the cyſt, and cannot therefore be diſſected off. When the integuments are ſtill looſe, upon taking them off, the pectoral muſcle is found with its fibres thinly ſcattered over the protruding ſac, and ſtrengthening it; and the ſac itſelf appears to be compoſed of condenſed cellular membrane, with ſomething like the natural coats of the artery forming its inner layer.

If it be intended to make a preparation of the diſeaſed parts, the ſternum being looſened from its attachments, the heart may be taken out alongſt with it, and afterwards diſplayed with the dilated ar-

* See Plate XVI.

tery puſhing through the interſtices of the ribs. It, however, ſeldom happens that we can be thus far maſters of our time in private diſſection. When the ſternum is raiſed in the common way, the tumor of the aorta is found adhering with a broad circumference to the under ſide of the ſternum: this muſt be cut through, and with the coats of the aorta we muſt cut much hard coagula of blood.

Upon examining the under ſide of the ſternum, the bony part of the ſternum will in general be found waſted by the blood. Sometimes the cartilages, alſo, are found waſted; but they ſeem better to reſiſt the blood. The blood muſt affect the bones by inſulating them, and depriving them of the membranes which nouriſh them, and alſo by mechanical action. Upon examining the aneuriſmal ſac, it will be found greatly thickened, irregular, with white callous ſcales or tubercles embued with a matter reſembling pus; and upon the inſide of the ſac lamellated clots, partly reſembling membranes, partly concreted blood. Upon turning the attention to the heart, it will, I think, be found ſmall and firm in its texture, and forced lower down in the breaſt. Upon looking down into the dilated aorta, the valves appear thickened and white with concretions.

In thus deſcribing the manner of examining theſe aneuriſms of the great arteries, the moſt common circumſtances attending them have been detailed; yet a great variety of appearances muſt preſent themſelves to us. The coats which fill up the great bag of the tumor ſhould be examined, ſo as to acquire ſome idea of their progreſſive formation; for this may perhaps explain ſome of the ſymptoms during the patient's life, as the ſudden ſubſiding of the tumor, its more ſuppreſſed pulſation, &c. Or the tumor of the artery may be found compreſſing the trachea or lungs, or encroaching upon the cava, or in ſome more immediate way affecting the reſpiration or the circulation of the blood.

Of the veins.—Dilatations in the veins near the heart never happen but as a conſequence of the dilatation of the right ſide of the heart with blood; and in that caſe it is not a permanent increaſe of ſize in the veins, but a dilatation from the occaſional fulneſs, cauſed by the difficulty of circulation in the heart:—it is ſtrictly connected with the diſeaſes of the heart, and they cannot be conſidered ſeparately.—A remarkable diminution of ſize in the veins near the heart is more common. In Plate VI. there is given a ſlight etching of the veins of a child at this place, where they were not larger than the veins of the arm. I had no opportunity of obſerving the effect of this during the patient's life: but the ſize or fulneſs of the heart ſeemed in no way affected by it.

There are inſtances of the great veins being quite impervious; a fibrous polypus-like matter, or hard fleſhy ſubſtance, or a fatty medullary-like ſubſtance, filling up their cavities. And that they were impervious during life was confirmed in theſe inſtances, from the ſmaller veins being dilated to carry the blood; in one caſe, the ſpermatic vein in the belly; and in another inſtance, the vena azygos in the breaſt, performed the office of the cava. There have been found in the leſſer veins (in thoſe of the pelvis, and parts of generation, it would appear, more frequently) little ſtony concretions, round, and ſometimes moveable. Ruptures, too, of the great veins are ſaid to have happened; but this is a very rare diſeaſe. I have ſeen however a tumor ſeated upon the abdominal cava, which ſeemed to have deſtroyed the coats of the vein; for a ſpongy tumor projected into its cavity, and the blood ſeemed to have exuded into the tumor which covered all the roots of the cœliac, upper and lower meſenteric arteries. The peculiarities in the veins of the extremities come afterwards to be conſidered.

DISEASED APPEARANCES UPON OPENING THE PERICARDIUM.

Upon opening the breaſt, there is always more or leſs water found in the pericardium. When the quantity is conſiderable, it is commonly accompanied with general dropſy or hydrothorax: the colour of the fluid takes a tinge from the blood, in the ſame way as macerating the heart in water would colour the water, though the cavities of the heart were tied up.

The pericardium is ſuppoſed to have a greater proportion of water, becauſe it has a greater degree of action; but the additional explanation of Mr. John Hunter, viz. that it may alſo fill up the interſtices betwixt the rounded ſurfaces, though ingenious as applied to the pericardium, does not mark a difference betwixt other cavities and the pericardium. Even the ſmaller collections of water in the pericardium are frequently accompanied with ſimilar collections of water in the other cavities of the breaſt, and even in the belly; but water, if contained in the pericardium, is at once obſerved; while the ſmaller quantities of water in the cavity of the breaſt ſink behind the lungs, and are not diſtinguiſhed. Extravaſations of water into the pericardium are common in all lingering diſeaſes, where the ſtrength of the ſyſtem is completely exhauſted. It probably is thrown out in the laſt feeble efforts of life. It is obſerved, that however much water there may be contained in the pericardium, ſtill, upon diſſection, this membrane is not found diſtended, but appears rather looſe about the heart. This may happen from a deficiency of blood at this time in the heart, while in the living body the heart, during its utmoſt diſtention, may have been cloſely embraced by the pericardium.

In the pericardium there are often found ſpots of extravaſation, the effect probably of recent inflammation. Sometimes the inflammation is more generally diffuſed over its ſurface; or we find adheſions formed at different points betwixt the heart and pericardium; and it happens alſo, though rarely, that the adheſions are complete in all the extent, uniting the pericardium with the whole ſurface of the heart.

Exudation of coagulable lymph is frequent within the pericardium. The lymph thus thrown out being by inflammation connected with both ſurfaces (with the heart and with the inſide of the pericardium), is found drawn curiouſly into fibres; or perhaps taking a firmer hold upon the heart, and forming no communication with the pericardium, it is found adhering to the heart with an irregular and ſpongy ſurface towards the pericardium.

The pericardium is liable to a more permanent diſeaſe. It becomes thick, ſo as to be eaſily ſeparated into layers like the coats of arteries, though in a leſſer degree. And although we ſhould not ſuppoſe ſuch membranous ſurfaces as the pericardium liable to ſuch a diſeaſe, it has been found ſtudded over with white ſchirrous tumors containing pus.

Matter, too, is found upon the ſurface of the heart; for it is ſubject to ulceration. I have ſeen it irregular and foul with diſeaſe upon the ſurface, and covered with a viſcid matter; ſo that it ſeemed wonderful that the patient could have exiſted for a moment. In ſuch a caſe as this, we may naturally expect to find the lungs adhering to the outſide of the pericardium, and the pericardium again to the heart.

I have ſeen a fracture of the ribs, from extenſive ſinuſes with caries, affect the lungs, communicate diſeaſe to the pericardium, and the pericardium thickened, containing much matter within it, and a ſmall opening communicated from the ſac of the pericardium and the extenſive abſceſs in the lungs. The ſubſtance of the heart too was diſeaſed, the outer membrane greatly thickened, and a greeniſh, thick, and adheſive matter upon its ſurface; yet here, in the laſt days of the man's illneſs, there was no peculiar ſymptoms, nothing differing from a common hectic fever.

When the blood is found extravaſated into the pericardium, it would appear that it is ſometimes difficult to diſtinguiſh the rupture from whence the blood came; whether it was from the root of the aorta, from the eroſion of the ventricles, or from the coronary veins or arteries. And in all ruptures it will be

frequently neceſſary, after carefully examining the coats, to waſh the heart out with warm water, and to ſyringe it gently into the great veſſels, obſerving carefully from whence it eſcapes. When blood is extravaſated into the pericardium, it does not ſupport the action of the heart by its reſiſtance to dilatation; but, on the contrary, the more that the pericardium reſiſts, the more it muſt encumber the action of the heart: and when at laſt the diſeaſe proves fatal it is by the extravaſated blood ſuppreſſing the action of the heart; for in proportion as the action of the heart is great in propelling the blood betwixt the heart and pericardium, ſo muſt the compreſſion of that blood be in reſiſting the future dilatation of the heart.

Of the appearances of the heart as altered by disease.—There are no two appearances ſo common, and ſo much connected, as a bloated, ſoft, and watery ſtate of the body, and a ſoft, flabby, and enlarged heart—where the heart ſeems in ſympathy with the languid and diſſolved ſtate of the body. Such a ſtate of the heart may be expected when the complexion has been of a pale and leaden colour, with languor of all the bodily functions, and a gradual loſs of ſtrength; the pulſe becoming weak and ſmall, accompanied with frequent faintings, and ſenſe of weight and oppreſſion at the heart. The conſequence of a diſordered ſtate of the functions of the lungs upon the heart, and the loſs of that reciprocal connection which is kept up during health, muſt often give riſe to ſymptoms which are aſcribed indiſcriminately to the heart. When the breathing is gradually ſtopped in experiments with artificial breathing upon living animals, the heart becomes languid in its actions, and ſwells up with blood, which it is unable to propel. The blood undergoes its changes in the lungs imperfectly, and in this ſtate is received into the circulation, and is ſent into intimate union with the whole body. The effect of this contaminated blood is immediately perceptible upon the heart,—not that it is leſs capable of irritating the heart to action, but that it is incapable of beſtowing the principle of action upon it, through the medium of its circulation in the coronary veſſels. Then the irritability of the heart is deſtroyed, the blood is puſhed into the heart by thoſe powers which are not ſo immediately affected by the loſs of the moſt eſſential properties of the blood, and the auricles and ventricles are overpowered with blood. This is an experiment which we muſt conſider as imperfect, but it may lead us by analogy to the explanation of nearly the ſame phenomena in diſeaſe. When the powers of the ſyſtem fail, when the action that muſt take place betwixt the fluids and ſolids is in any way interrupted, then is the delicate ſenſibility of every organ to its peculiar ſtimulus and action diminiſhed. And when ſuch an effect as this is produced upon the heart, (and it muſt take place in the laſt ſtages of many debilitating and tedious diſeaſes), then does this ſtate of the heart almoſt infallibly preſent itſelf upon diſſection; the heart is enlarged, ſtuffed with blood, and flaccid in its texture, the aqua pericardii is in conſiderable quantity—and often the whole body is tabid. In this caſe, where the diſtention of the heart is habitual, the aorta is found remarkably ſmall, being allowed gradually to contract its diameter, to ſuit the weak contractions of the heart; but ſtill the artery is not (as we ſhould expect from this explanation) thick, as if its coats had contracted, but remarkably thin and delicate. Nor muſt we ſuppoſe, that the ſtate of the artery is in contraſt with that of the heart—the heart being diſeaſed, while the artery is in a ſtate of healthy contraction; for the artery ſuffers the ſame loſs of power with the heart. The difference is, that much blood is ſent in upon the heart, which it is unable to puſh forward, and its ſides are thin and dilated, while in the arteries there is a deficiency of blood.—Were it poſſible to conceive, that the heart ſhould regain its healthy powers while the artery remained in this ſtate, the artery would be too weak for the powers of the heart. It muſt be remembered, that though the muſcular power of the artery is weakened, yet a permanent dilatation will not be produced whilſt its elaſticity remains:—for the arteries in their contraction have not to combat with the heart, but with the veins; therefore the arteries will not be permanently dilated by the contraction of the heart, unleſs when, as in their diſeaſed ſtate in aneuriſm, they are incapable of contracting again: And whilſt the

contractibility of the arteries remains greater than that of the veins, they will not be ſeen dilated in the dead body.

We find uniformly, that when the heart is diſtended with blood, the right ſide of the heart is the moſt diſtended. This may be explained from the conſideration of the difference betwixt the two circulations. The circulation through the body is the moſt extenſive; and having greater power, muſt, upon the ceaſing of the heart's motion, continue for a little to pour the blood into the right auricle and ventricle, while the left ſide of the heart has neither the ſame quantity of blood in the circulation of the pulmonary veſſels, nor are theſe veſſels ſo extenſive, nor do they poſſeſs ſo great an elaſticity, as the aortic ſyſtem, and the extended veins of the body. Neither will the thick and ſtrong ſides of the left cavities of the heart allow of diſtention ſo eaſily as the right. The blood in the great veſſels of the body is forced in upon the right ſide of the heart, when, from failure of its powers, it is incapable of propelling it into the lungs, and conſequently into the left ſide of the heart.

In conſidering palpitations of the heart, we muſt remember, that the natural pulſation of the heart againſt the ribs is not the dilatation or contraction of the heart itſelf, but the effect of its contraction upon the arch of the aorta, as explained by Dr. Hunter. But in violent palpitations of the heart, where it is enlarged, and weakened in its powers, and the aorta is ſmall and inſignificant, the palpitations have been ſometimes obſerved not to be ſynchronous with the pulſe at the wriſt, as the natural pulſation of the heart. In ſuch caſes, it may perhaps be the auricle which is affected with irregular motions when it is violently diſtended with blood; and the ventricles likewiſe being enlarged, the apex of the heart is forced againſt the ribs.

Palpitations or pulſations of the veins in the neck, and even of thoſe in the arms, ſometimes accompany enlargement and diſeaſe of the heart. To form a juſt conception of the cauſe of this pulſation, we muſt conſider the peculiarities in the ſituation of the veſſels near the heart (ſee p. 54, 55). The pericardium, inveſting the ventricle and auricle, ſuffers little dilatation by the action of the heart:—its greateſt dilatation is during the diaſtole of the ventricles; becauſe the ſpace filled by the dilated ventricles is ſomewhat greater than that of the dilated auricles; yet the difference muſt be very ſmall. The mediaſtinum involving the pericardium ſends its membranes round the great veins which reach upwards from the auricle, and ſtrengthens them. When, therefore, the veins in the thorax are dilated, and the whole heart enlarged, there muſt be a diſtention of theſe membranes likewiſe; and the diſeaſe is not confined ſtrictly to the vaſcular ſyſtem here, but even the diaphragm and involving membranes will be found relaxed, and the cavities dropſical. By the dilatation of the veins the action of their valves is affected; they become too ſmall for the diameter of the veſſel, and the blood paſſes them. But the auricular valves, or thoſe properly belonging to the ventricles, are not affected by the dilatation of the veins; their relaxation muſt depend upon the elongation of their muſcular attachments to the inſide of the ventricle. To cauſe a pulſation to be felt in the veins without the thorax, a loſs of power, both in the valves of the veins and in the valves of the heart, muſt have taken place:—becauſe, if the concluſion, page 59, be right, though the valves of the veins at the lower part ſhould have loſt their power, yet while the extended circulating powers return the blood with due vigour to the heart, the contraction of the auricle will not be felt retrograde upon the column of blood in the veins: But if the heart and veins be dilated, and the tricuſpid valve have loſt its action, ſo as to allow the blood to recede again from the ventricle into the auricle during the contraction of the ventricle (the contraction of the latter being greater than the firſt), the pulſation will be obſcurely felt in the veins of the neck, beating ſynchronous with the arteries through the body.

In examining theſe diſeaſes of the heart, therefore, in diſſection, or in conſidering the ſymptoms during life, much is left to be decided upon by reaſoning from the ſymptoms. It may be required to decide, Whether this pulſation be communicated to the enlarged veins by contiguous arteries—or by a

pulſation from the auricle—or whether it be communicated from the ventricle, through the auricle and the column of blood in the veins? or whether, again, the tremulous trilling feeling in the veins may not be produced by the action of both auricle and ventricle? In theſe diſeaſes, the pulſe is ſo irregular, and quick, and feeble, that it will be difficult to ſay whether the beating of the veins is ſimultaneous with that of the arteries (and conſequently of the ventricle). In diſſection, again, we have to examine the dilated ſtate of the veins near the heart, and the ſtate of their valves; the degree of relaxation over the whole membranes of the cheſt; the ſtate of the auricle; the relaxation of the ventricles, of the columnæ carneæ, and of the valves of the heart.

Dilatations of the cavities of the heart are improperly called aneuriſms: but there have been caſes which ſeem to have truly deſerved the name, where the ventricles of the heart have at a point been dilated into a pouch filled with coagulated blood.

Of diseased appearances observable upon opening the heart.—To examine the diſeaſes in the cavities of the heart, it is evident, that it muſt be diſſected with as much care as for the demonſtration of its ſimple anatomy (See page 44.). There is one circumſtance, however, which may be remembered, that it may be required to examine coagula or polypi of the heart, which may reach from the ventricles into the great veſſels, the aorta, or the pulmonary artery. To demonſtrate theſe through their whole courſe, the cavities of the heart may either be laid open while the heart is in the body, or the great arteries ſlit up, and the coagula withdrawn from them, and kept attached to the heart. And in this caſe, the coagula being ſtrong and minutely ramifying through the lungs or aorta, form a beautiful demonſtration, when the cavities of the heart are opened, and their roots ſhown attached to the irregular inſide of the ventricle, and the intricate interlacements of the cordæ tendineæ. That theſe polypi formed from the blood are for the moſt part formed after death, there can be little doubt; but ſtill there are circumſtances to be attended to which have induced many to believe that they are formed during life. They are found in layers, which argues a ſucceſſive formation; or they are attached to the ſides of the arteries where their coats are diſeaſed; and their attachment does not appear to be accidental or owing to the ſimple coagulation of the blood. In many inſtances, however, where theſe coagula are remarkably firm, and ſuch as we ſhould ſuppoſe were formed during life, we find, upon examination, that the extremity, which is looſe, lies in a direction contrary to the courſe of the blood; a direction in which we muſt be ſenſible it could not have remained during life; for it muſt have been driven in the direction of the current of blood, while the root was held nearer the heart. There muſt be coagula formed in dilated arteries; and to diſtinguiſh betwixt thoſe which have been formed during life, and impacted in layers filling the dilated bag, and thoſe which have been formed after death, is often impoſſible. How, then, in the caſe of the coagula prolonged into the great veſſels (which alone are called polypi), can we expect to diſtinguiſh what has been formed in the laſt feeble actions of the heart, from thoſe which have been formed after death? Were they ever formed in the vigour of the ſyſtem, we ſhould have had caſes of ſome ſmaller part being torn from the trunk or ſtem of the polypus by the force of the circulation, and driven into ſome of the branches of arteries, ſo as effectually to interrupt the circulation of ſome important part.

Upon the whole, in examining coagula in the heart and great blood-veſſels, it may be obſerved, whether they have been formed at once, and are of a uniform conſiſtence; or whether they are of different layers, and apparently formed one upon the other at different times, and during life; whether, when they are attached, they have their looſe extremities reverſe to the current of circulation; or whether they have coagulated ſo ſlowly that the red globules are depoſited or fallen from the upper part of the coat.

OF THE VALVES AS SUBJECT TO DISEASE.—The muſcular coat of the aorta is not continuous with the muſcular fibres of the heart; probably becauſe their actions are alternate: but the inner coats of the arteries are continuous with the lining membrane of the heart, and the membranous valves in the heart: the whole inner membrane of the heart, and even the tendons of the tricuſpid and mitral valves, are evidently ſubject to the ſame diſeaſe with the arteries. We ſee them partly of their natural colour, partly variegated with a more opaque whiteneſs, and increaſed in thickneſs.

THE SEMILUNAR VALVES of the aorta and pulmonary artery will be frequently found thickened and more opaque than uſual.—They are found oſſified, too, or with a depoſition of earthy matter. Upon opening the ſurface, there will be ſeen ſeveral little diſtinct ſacs. The eaſy play of theſe valves muſt be much impeded by this ſtate of diſeaſe: they muſt become ſtiff and rigid inſtead of being pliant, and floating eaſily with the tide of blood. The extreme tenuity of theſe valves, and the netted appearance of their edges, would incline us to believe that this alſo were a diſeaſed ſtate. But theſe deficiencies in the valves do not allow the blood to paſs them; they are only upon the edges, where the valves are in contact when in action. The appearance being as common in children as in adults, teaches us, that theſe holes are not worn by attrition *. It does not appear that there is an inſtance of any part of an animal body being liable to ſuch a waſte: it is endowed with powers to counteract it. Theſe valves have been found ruptured too; and this we ſhould naturally attribute to the force of the retrograde blood, and thence argue a great force in the contraction of the arteries. It is not impoſſible, however, that they might, when diſeaſed, have been ruptured by the violence of the heart's contraction occaſioning a great degree of dilatation in the root of the aorta, which they (being at all times more unelaſtic) might be unable to bear.

The MITRAL and TRICUSPID VALVES are ſubject to the ſame diſeaſed thickening, and to have concretions formed in them. In Plate IX. fig. 4. a view is given of the mitral valve of the right ſide of the heart in this ſtate of diſeaſe. Their ſmall tendons, too, if narrowly obſerved, will be found partaking in the diſeaſe, not uniformly of the ſame colour, but partly opaque, partly more tranſparent.

EXPLANATION OF PLATE IX.

FIG. I.—The arch of the aorta enlarged; with a portion of the lungs, containing a calcareous concretion attached to it—1, 1, Concretions in the artery ſeen upon its outer ſurface by the drying of the coats—2, The concretion in the lungs.

FIG. II.—A part of the aorta, where it proceeds from the heart ſlit up—1, Points to the opacities in the diſeaſed aorta, which, when further advanced, contain gritty matter—2, The ſemilunar valves thickened, and partaking of the diſeaſed ſtate of the coats of the artery—3, Concretions formed below the valves.

FIG. III.—The coats of the aorta at its bifurcation into the iliac arteries, held thus extended, though dried, by an extenſive ſcale of oſſification.

* Continued preſſure ſeems to have a greater effect in cauſing abſorption; as in tumors preſſing upon the bones, in the growth of the permanent teeth encroaching upon the temporary teeth, or in the beating of arteries and aneuriſmal tumors upon the bones. But all theſe are imperfect analogies. The part which poſſeſſes the greateſt vigour is not abſorbed, but remains unaffected, whilſt the other is waſted, as in the teeth; and ſoft parts reſiſt while the bone is abſorbed.

Fig. IV.—The mitral valve loaded with concretions.

Fig. V. The femoral artery in a diſeaſed ſtate, with its coats diſſected—1, 2, The outer coats of the artery diſſected into two layers—On the other ſide, 3, they are ſeparated into three layers. The muſcular coat is expoſed with its fibres running in circles round the artery : It is inaccurately marked 3 in the text—4, Is the inner coat of the artery, with ſcales of oſſification connected to it.

Fig. VI.—The femoral artery diſſected from the ſtump after amputation—1, The great ligature tying the trunk of the artery, and including a branch (2) of the anterior crural nerve—3, Another branch of the nerve included in the ligature tying a ſmaller branch of the artery—4, The crural nerve—5, The clot reaching up into the pervious part of the artery, and adhering to its ſide—At 6 the clot coaleſces more intimately with the coats of the artery—7, Part of the cellular membrane which ſurrounded the artery condenſed by inflammation, and adhering to it.

Fig. VII.—The ſplenic artery oſſified—1, 1, That part of the artery, which, being membranous ſtill, has ſhrunk in the drying—2, Scales of concretions almoſt totally ſurrounding the artery.

Fig. VIII.—The artery of the ſtump left more rudely diſſected than in Fig. VI.—1, The cavity of the artery—2, The clot—3, The inflamed cellular ſubſtance ſurrounding the artery. The accompanying vein is ſeen opened likewiſe, and its coats much thickened.

Fig. IX.—The femoral artery, with a ligature upon it for the cure of the popliteal aneuriſm. 2, A piece of wood included in the ligature 3,—4, A probe paſſed into the artery where its coats were cut by the ligature.

DISEASED APPEARANCES IN THE THORAX, INDEPENDENT OF THE HEART AND GREAT VESSELS.

Pleura.—The inveſting membrane of the thorax has the ſame ſtructure with the peritoneum. It is a ſimple membrane, with many veſſels ramifying in it. Theſe, in their natural ſtate, ſecrete a halitus, or rather they, unremittingly, perſpire a fluid which moiſtens the ſurface, and prevents the lungs from adhering to the pleura coſtalis. When this natural ſecretion is vitiated, when the veſſels are dilated, or the reabſorption of fluid obſtructed, there is dropſy of the cheſt, and then we find frequently a white or yellowiſh turbid matter adhering to the ſide of the cheſt, or ſurface of the lungs.

Of adheſions of the lungs.—Adheſions of the lungs to the pleura, where it lines the ribs, or where it covers the pericardium, are ſo frequent, that they need ſcarcely be conſidered as a diſeaſe, at leaſt they are of no account in inveſtigating the cauſe of death ; for it would appear that the ſlighteſt inflammations during any period of the patient's life, even from colds which paſs unobſerved, produce adheſions which are never afterwards removed.

To account for the more frequent occurrence of inflammation and adheſions in the membranes of the breaſt, there have been ſeveral hypotheſes ſuggeſted ; and particularly it has been ſaid, that the veſſels which ſupply theſe interior membranes are branches of arteries common to the pleura and integuments of the breaſt ; and that the outer branches being more liable to occaſional derangement in their action, an accumulation is brought upon the inner branches. But the diſtribution of the mammary and intercoſtal arteries, when compared with the epigaſtric in the abdomen, or with the diſtribution of veſſels to any other internal membrane, does not ſupport ſuch a conjecture ; for they alſo have external

Plate IX.

Fig. II.

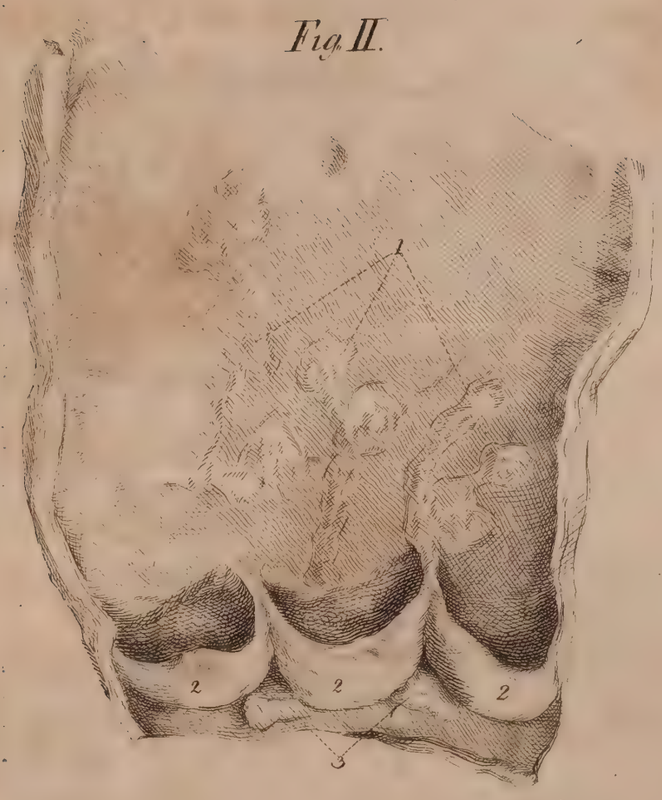

Fig. III.

Fig. I.

Fig. V.

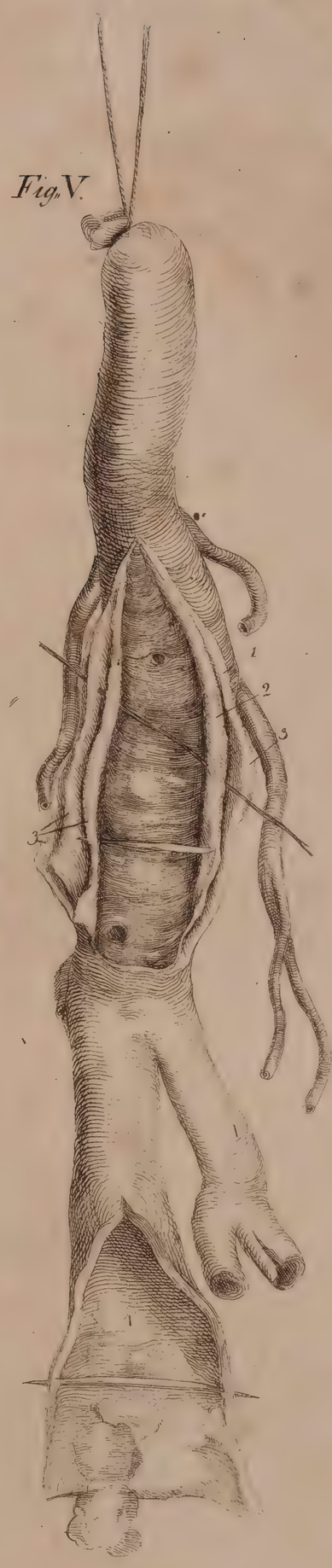

Fig. IV.

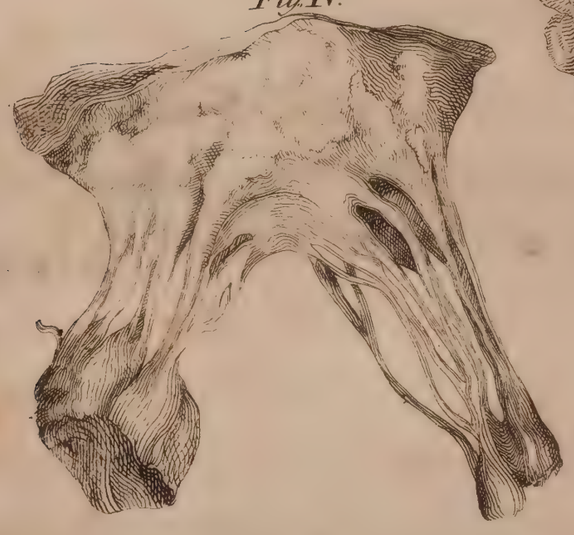

Fig. VI.

Fig. VII.

Fig. VIII.

Fig. IX.

Drawn by Charles Bell

Pub.d April 1798. by Charles Bell Edin.r

Engd by Chas. Bell

branches; and if there be found a greater frequency of inflammation in the thorax, it may rather be imputed to the peculiarity of the lungs as inhaling the air, and being conſequently more liable to ſuffer from the viciſſitudes of the weather.

Consequences of inflammation.—Inflammation exiſting immediately before death often throws out a layer of coagulable lymph upon the pleura; and it can be felt upon the inner ſurface of the ribs, and torn from them with the fingers, a tremulous gelatinous layer; or upon the ſurface of the lungs a jelly is thrown out, which can be wiped away with a cloth. Theſe exudations approach in their more advanced ſtages to the appearance of membranes, and can with difficulty be diſtinguiſhed from the original membranes. Any vacancy found in the thorax from diſeaſe, as from the deſtruction of the lungs of one ſide, and the formation of pus, is generally accompanied with theſe layers of coagulable lymph upon the inner ſurface of the ribs, and with inflammation and thickening of the pleura; or we find a ſerous fluid in the bottom of the cheſt, with flakes of the coagulable lymph, like membranes, floating in it.

When the lungs become diſeaſed, and abſceſſes are formed in their ſubſtance, the inflammation extending round them, and communicating through the pleura pulmonalis, or external coat of the lungs, forms adheſions betwixt the lungs and ribs or pleura coſtalis. By this means the matter of the abſceſs, when it has made its way out of the lungs, is ſtill held confined in a ſac, and prevented from ſpreading freely into the whole cavity of that ſide of the cheſt. From this pervading of the inflammation previous to the burſting of an abſceſs in the lungs, we have frequently this appearance upon opening the breaſt: the lungs are compreſſed, hard, and apparently incapable of their function; coagulable lymph is extended upon the ſurface of the pleura; partitions are formed extending from the inner ſurface of the ribs to the collapſed and hardened lungs; ſinuſes of matter are ſeen running among theſe irregular adheſions, and the lungs themſelves, if far advanced in the diſeaſe, are full of pus in many places, which eſcapes upon their outer membrane being torn open.

Of Empyema.—This is matter lodged betwixt the lungs and pleura. The abceſs or vomica in the lungs, and the matter in the pericardium or mediaſtinum, is not empyema, until they have burſt and diffuſed the matter in the cavity of the breaſt.

Collections of matter may be formed in the cavities of the cheſt, independent of the lungs, from the inflammation of the pleura advancing to ſuppuration; and collections of matter, or of ſerum, have been found betwixt the pleura coſtalis and the ribs, which have puſhed the pleura in upon the lungs, and compreſſed them. It would ſeem to be a general opinion, that matter formed in the membranes, independently of the lungs, has a greater tendency to open outwardly by the intercoſtal ſpaces, than that matter which, though lodged in the cavity of the cheſt, was originally derived from the lungs. In fact, the true empyema is often occaſioned by injuries from falls or violent exerciſe, as wreſtling, followed by deep pain in the breaſt. Rupture and laceration of the intercoſtal muſcles is much dwelt upon by the older writers, as a cauſe of empyema; in theſe contuſions and injuries of the bones, the matter more readily finds its way outwardly. See page 40. It is not by the preſſure of the lungs in expanding, as ſober phyſicians write, that the matter of empyema has ſometimes been naturally evacuated by the ſide, but by the communication of inflammation and ulceration; and the old practice of burning the ſide, or making an inciſion until the pleura was bare, had the effect probably of procuring a tendency to this natural evacuation.

Of the lungs in a state of disease.—In cutting into the ſubſtance of the lungs of conſumptive people, the moſt frequent appearance is groups of little white or variegated tubercles. Theſe, in a more

advanced ſtage of the diſeaſe, make the ſurface of the lungs hard and irregular; and when the lungs are cut into, the tubercles are found to be larger, and to have run together into maſſes, and commonly little abſceſſes or VOMICÆ have formed in them;—or, the tubercles being diſtinct, they are found to contain a white thick pus. In their ſtill further advancement, they have totally degenerated into matter, which is contained in diſtinct ſacs; and the whole lungs gradually approach to that ſtate which has already been ſlightly deſcribed, viz. the lungs contracted, and with hard cartilaginous or ſchirrous tumors,—ſmall purulent abſceſſes, or large vomicæ, and ſtuffed up with innumerable irregular tumors,—ſome dormant, others inflamed and ſuppurated. The term Vomica, ſhould be confined to the lungs perhaps, but faculated collections of matter in the pleura, or intercoſtal ſpaces, are alſo termed vomicæ by authors.

I have found tumors projecting from the ſurface of the lungs, and interſperſed widely in their ſubſtance, of quite a different texture from theſe tubercles, being of a very vaſcular and porous, or cellular nature, or, in other words, bloody tumors. Thoſe upon the ſurface are of a reddiſh colour, and covered with a ſmooth membrane. They have no tendency to ſuppuration. I have found them in a ſubject, where there was a ſimilar diſeaſed ſtructure in the liver, and lymphatic glands, and in the ſubſtance of the teſticle.

In pneumonia in general, there is redneſs on the ſurface of the lungs; perhaps a univerſal dark redneſs in the cavity of the cheſt, a white or bloody ſerum is effuſed, and in the bronchiæ there is often a gelatinous effuſion or mucous matter. In thoſe dying in the early ſtages of the diſeaſe, this effuſion of a thick fluid-like pus, is the immediate cauſe of death; or a termination ſtill more ſuddenly fatal, may have been occaſioned by the effuſion or extravaſation of blood into the cellular texture of the lungs interrupting their function. And in theſe caſes, or as in the fever of the Weſt Indies, the lungs being found like a ſponge filled with blood, the pain ſhall have borne no relation to the danger, there being an inability of expanding the cheſt, more than local pain.

OF THE STATE OF THE LARGE VESSELS IN ABSCESS, &c.—In large abſceſſes of the lungs, where they are in a manner degenerated into ſacs full of matter; or in that ſtill more extraordinary ſtate of the viſcera, where one of the lungs is waſted to the mere bud of its root, and the whole ſide of the cheſt is left empty, with a mixture of pus and water in the bottom of it—the pulmonic veſſels have been found with open mouths, as if opening into the cheſt. In general, in this ſtate of the lungs, the veſſels will be found contracted at their extremities for about an inch and a half, and cartilaginous to the feeling; or inſtead of this, probably in a leſs advanced ſtate, there have been found coagula formed in their extremities, plugging them up like the artery of a ſtump after amputation. From examining the ſtate of large arteries, either when ſtopped by ligature or by an effort of nature, as in the formation of abſceſſes, it would appear that the formation of coagula depends much, if not entirely, upon the coats of the artery. In ulcerated ſurfaces, and in the formation of matter (as in the preſent inſtance, in the lungs), the coats of the artery, partaking of the inflammation in which it is involved, and which extends from the ſurface ulcerated to the ſurrounding parts, form a clot by the exudation from the inner ſurface of the veſſel, and partly from the maſs of blood in its cavity.—And the clot thus formed has a firm hold upon the ſides of the veſſel, and an intimate connection with it. It is the connection with the ſurrounding parts which ſupports the artery of an aneuriſm, or of a ſtump, after being tied. This connection, by ſupplying its little veſſel, gives ſupport to its inflammation, and aſſiſts in the production of a healthy clot. But if the artery be left expoſed in the middle of an abſceſs, or left diſſected from the ſurrounding parts, then that part which is expoſed will have no proper clot or contraction of its coats; but the coagulum which ſtops the bleeding will be found at that point of the artery which has a connection with the ſurrounding fleſh. If, again, the coats of a veſſel tied in an aneuriſm (as that marked in

fig. IX. Plate X.) be diſeaſed, partaking of that offified ſtate which has already been fully deſcribed as accompanying the dilatation of arteries, they will probably (as in the caſe from which this drawing was taken) be rendered by irritation unſuſceptible of active inflammation: and upon the cutting of the artery by the ligature, there will be found no proper clot formed in the artery coaleſcing with its coats, ſo as in time to form a complete union; but, on the contrary, there is nothing to reſtrain the blood from flowing but the mechanical tying of the ligature, ſo that immediately upon the cutting of the artery by the ligature, the blood eſcapes. It is certain, that in thoſe diſſections deſcribed by Haller and others, in which the mouths of the trachea and great veſſels were ſeen projecting from a remaining bud of the lungs, the clots muſt have been formed a little within the mouths, and the veſſels cloſed up in the common manner.

Of concretions of the lungs.—In Plate IX. fig. 1. is repreſented an earthy concretion adhering to the aorta: It was found in the lungs of a phthyſical ſubject, and is rather a frequent occurrence. The lungs were indurated, and adhering in many places;—they ſeemed to have ſuffered much inflammation, and adhered firmly to the pericardium and great veſſels. There were many ſuch maſſes of calcareous concretions throughout the lungs; and this part was kept attached to the diſeaſed aorta, as at that time I thought it might have had ſome connection with the diſeaſed ſtate of its coats. Theſe calculi in the lungs are found in irregular cyſts, crumble eaſily in the fingers, but take a ſtony firmneſs when dried. They grate upon the knife in diſſecting the lungs; and, it would appear, are ſometimes found in the extremities of the branches of the trachea. I have ſeen them ſo large as to preſs upon the aorta and upon the trachea, turning them from their ſeat.

The lungs are not unfrequently found turgid with air, and incompreſſible, not ſubſiding upon the opening of the thorax, nor even when pricked with the knife. In ſuch caſes they are ſometimes red with blood, or are ſpotted with black extravaſated blood upon their ſurface;—or when cut into, thick pus is gradually expreſſed from the ſmall branches of the trachea (as was the caſe of the ſubject from which Plate VI. was drawn), or much froth is found in the branches of the aſpera arteria; and when cut into, they are found ſtuffed with viſcid ſlimy matter.

The colour of the lungs, too, muſt be obſerved, whether affected by inflammation, or whether ſeeming to be more permanently changed:—they may be found blanched and pale, or of a cineritious colour, from the loſs of blood; or they may be found variegated in their colour, betwixt a purple and a lake, ſtudded with white opacities, produced by tubercles. It muſt be always remembered, that in diſſection, allowance ſhould be made for the gravitation of the blood towards the back part, the body lying ſupine after death. The patient dying, or ſoon after death being left, upon his ſide, will occaſion the blood to gravitate, and then coagulating, to give the appearance of diſeaſe.

Of examining the trachea.—It will frequently be neceſſary to examine the inſide of the trachea through its whole length, as it is often the ſeat of diſeaſe. It may be neceſſary to examine it to know the cauſe of ſuffocation:—it may be compreſſed by tumors;—it may be eroded by obſtinate ulcers; it may be inflamed, and polypous membranes may have been thrown out from its inner ſurface, which being ſometimes expectorated, reſemble veins; being moulded to the branches of the trachea, and pervious. When the trachea is to be examined, in order to trace a diſeaſe which is connected with the lungs, the inciſion may be continued from the thorax upwards upon the fore part of the neck, and the trachea laid bare:—and being cut below the thyroid cartilage (or even the whole larynx being diſſected out), it may be diſſected from the œſophagus, and carried down to its bifurcation in the lungs; it being kept at the ſame time attached to the lungs by its branches. It can then be opened upon its

back part, and ſlit down its whole length, when any polypous membranes thrown out by inflammation may be diſtinctly ſhown, and traced in their progreſs in the lungs. When the trachea is replaced, and the inciſion upon the neck ſewed up, the body is left in no way unſeemly about the face; which in private diſſection muſt always be avoided.

The Diſſection of the Diſeaſes of the Throat will be afterwards conſidered in treating of the Neck and Head.

Diseased appearances in the mediastinum.—The posterior mediastinum which ſurrounds the great veſſels that run down the ſpine behind the great viſcera of the thorax, is not unfrequently the ſeat of diſeaſe. The lymphatic glands which lie at the root of the lungs are ſometimes diſeaſed; they are enlarged; or gritty matter is found in them which grates upon the knife; or they are found in a ſtate of ſuppuration. Their diſeaſe will perhaps account for ſome of the ſymptoms which may have occurred during life; for they may be found to have compreſſed the trachea, the œſophagus, or the great veſſels, as the aorta, thoracic duct, or vena azygos.

When the conglobate glands are affected in one part, it will be found more or leſs a general diſeaſe in the thorax, in the courſe of the aorta and iliac veſſels, in the meſentery, &c. When abſceſs forms in the poſterior mediaſtinum, it has no outlet, and it has been known to make very ſtrange and extenſive ſinuſes amongſt the cellular membrane.

The anterior mediastinum differs in no reſpect as to its diſeaſes from other depoſits of cellular membrane where there is much fat and many glands and blood-veſſels: it is ſubject to inflammation and the formation of abſceſs. Matter here has deſtroyed and rendered carious the ſternum, forming a ſoft tumor, with fluctuation above the bone. In ſuch caſes, the pulſation of the heart being communicated to the matter, an aneuriſm has been preſumed, and the patient terrified with the idea of ſudden death.

A great accumulation of fat here has been conſidered as a ſerious diſeaſe, and even upon diſſection aſſigned as the cauſe of death.

The premature accumulation of fat upon the viſcera may be conſidered as a diſeaſe, though in old people it is natural. This load of fat upon the viſcera is the laſt ſtage which the adipoſe membrane undergoes from the fœtus to old age. But the qualities of the fat, and its place of depoſite, are more changed than its quantity. It is not drawn from the extremities to the heart and viſcera, but from the ſurface to the interior parts. In the fœtus, when the hard and unelaſtic integuments are diſſected off, the muſcles are left bare, and the further diſſection is eaſy, the fat being firm and inſulated, and external chiefly. Here the delicacy and neatneſs and beautiful form of the muſcles and tendons will be more the object of admiration than even in the adult. The integuments of the fœtus in delivery is its great ſtrength. In a youth, whoſe limbs have become ſhapely, the fat is more equally diffuſed over the interſtitious cellular membrane, the diſſection becomes more difficult. And in old age it has become ſtill more tedious and impracticable; for every part oozes out oil, and the diſſection can never be freed from fat. The fat, which to the infant gave unformed rotundity, and to the middle age ſymmetry and ſhape, has left the integuments, and is more equally diſtributed; it is now more accumulated about the internal parts, and more intimately blended with them. The fat does not remain in the cells any length of time, but, like the reſt of the body, it muſt ſuffer a perpetual ſeries of changes; be reſumed into the circulating ſyſtem, as ſubſervient to other uſes, whilſt the cells are at the ſame time filling with a new depoſition. It is natural to ſuppoſe, that the ſtate of the fat changes with that of the ſolids, and has a ſtrict connection with the economy of the body. Yet how inſufficient is that explanation of the accumulation of fat about the viſcera which aſſigns to it the uſe of rendering pliant

and eaſy of motion theſe important parts which are now ſtiff and inactive with old age: it is to ſuppoſe the moſt important viſcera of the body to be greaſed like the wheels of an engine.

The membranes of the body, though loaded with fat, are not oily upon their natural ſurface: the attrition of ſurfaces in an animal body is prevented by their own ſecretion; and the animal oil, though it eſcapes upon the adipoſe membrane being ſlit up, yet in the living body cannot tranſude, to oil the moving parts. It is not long ſince the opinion was entertained, that the fat was laid in the track of the coronary veſſels of the heart, to preſerve them from thoſe diſeaſes to which the arteries were liable in other parts of the body; the evil conſequences of which would be manifold in the heart.

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DIRECTIONS FOR THE BINDER.

N. B. Plate VIII. is thrown out of this Edition.

A

SYSTEM

OF

DISSECTIONS.

PART III.

CONTAINING

THREE DISSECTIONS OF THE PERINEUM,
INFERENCES DRAWN FROM THESE VIEWS OF THE PARTS,
THE SECTION OF THE PELVIS,
POINTS OF SURGERY ILLUSTRATED BY THE SECTION OF THE PELVIS,

THE CONTENTS OF THE PELVIS AS SEEN FROM BEHIND, AND PLAN OF THE ARTERIES,
OF THE DESCENT OF THE TESTICLE,
OF HERNIA, HYDROCELE, &c. AS ILLUSTRATED BY THE ANATOMY OF THE TESTICLE,

OF THE INVESTIGATION OF DISEASE IN THE PELVIS,
AND OF THE MORBID STATE OF THE PARTS.

WITH PLATES.

SECOND EDITION.

BY CHARLES BELL, SURGEON.

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1800.

A

SYSTEM

OF

DISSECTIONS.

ANATOMY AND DISEASES

OF THE

PELVIS.

DISSECTION OF THE PERINEUM,

Or of thoſe Parts which are chiefly implicated in the Operation of Lithotomy, and in the Diſeaſes of the Urinary Paſſages and Rectum.

PREVIOUS to the diſſection of the perineal muſcles, the arteries of the pelvis and of the lower extremities ought to be injected, that the important branches of the pudic artery, and their connection with thoſe muſcles, may be underſtood. The cavernous bodies of the penis ſhould alſo be injected, and the ſubject placed upon the table as the patient is held for the operation of lithotomy.

FIRST STAGE OF THE DISSECTION

GENERAL VIEW OF THE PARTS TO BE LAID OPEN IN THE FIRST STAGE OF THE DISSECTION.—In this diſſection, as the muſcles and delicate arteries to be demonſtrated lie deep amongſt much looſe elaſtic cellular ſubſtance, it is of ſome conſequence to mark the depth and level of the parts. Becauſe, although at firſt the ſtudent is circumſpect, diſſecting with caution, perhaps with timidity; yet gaining courage as he proceeds, and finding that he is only ſeparating the cellular membrane, he plunges with more determined ſtrokes of his knife, till at laſt he, with much diſappointment, finds the external ſphincter of the anus, or the tranſverſalis muſcle, cut away, and the demonſtration deſtroyed: like thoſe ſurgeons who, being ſtrongly impreſſed with the idea that deliberation is the characteriſtic mark of their ability, commence their operation with an affected gravity of countenance and tedious cruelty; while in the important ſtage all

is indiſcreet hurry and confuſion. In both caſes the celerity and ſucceſs depend upon the knowledge of the points in which caution is required.

The rectum having been ordered to be thorougly cleaned, a little baked hair may be introduced into the extremity of the gut, which will keep the anus gently protruding during the diſſection; or a cork with a loop attached to it being introduced, and the mouth of the gut tied upon it, the diſſection will be much facilitated, and the demonſtration aſſiſted, in conſequence of the complete management we have of the gut; for we ſhall thus be able to turn it in every direction, ſo as to ſhow its connections.

The place of the ERECTOR PENIS (A A, Plate X.), being evident, ſince it reſts upon the ramus pubis and crus penis, it cannot be deſtroyed, and ſhould be our firſt object in the diſſection, as ſerving, in ſome meaſure, for a guide in the diſſection of all the other muſcles. The next point in the diſſection is the ACCELERATOR URINÆ (B), whoſe general courſe and appearance is ſufficiently evident from the plate: its place we cannot fail to find, though the delicate fibres may be deſtroyed.

In diſſecting the EXTERNAL SPHINCTER (C) we have to recollect, that it conſiſts of looſe fibres encircling the mouth of the gut, and lies immediately under the ſkin. This muſcle is, however, frequently miſſed in diſſection, and it is indeed difficult to ſhow it neatly.

A ſure guide in the diſſection of all theſe muſcles, but chiefly of the TRANSVERSALIS PERINEI, is the tuberoſity of the iſchium; for the tranſverſalis perinei, taking its origin from the tough tendinous-like membrane of the os iſchium, runs directly acroſs to the general point of union, lying about two inches deep in the elaſtic fat, which fills the ſpace betwixt the anus and os pubis. By carrying the knife in the courſe of this muſcle, it will not be unwarily cut acroſs; its fibres being, in this manner, much more eaſily diſtinguiſhed, and extricated from the ſurrounding cellular ſubſtance.

MUSCLES.

EXPLANATION OF PLATE X. FIG. 1.

A A, ERECTOR PENIS.—A neat and delicate muſcle ariſing from the os iſchium; ſtretches its muſcular fibres over the lower part of the crus penis; and ſpreading its expanded tendon, gradually coaleſces with the ſheath of the crus penis.

B, ACCELERATOR URINÆ.—From the middle tendinous line, as from a common origin, the fibres, diverging, run obliquely upwards on either ſide, embracing the bulb and lower part of the corpus cavernoſum urethræ with a coat of muſcular fibres; which, collecting into diſtinct tendinous ſlips, are inſerted into the crura penis.

C, SPHINCTER ANI.—The fibres of this muſcle, running in circles round the mouth of the gut, it can ſcarcely be ſaid to have an origin or inſertion. It takes hold of the os coccygis behind, and is attached to the accelerator urinæ before: more intimately and immediately embracing the lower portion of the gut, are the ſtronger fibres of the INTERNAL SPHINCTER.

D D, TRANSVERSALIS PERINEI ariſes from the tuberoſity of the iſchium, is inſerted into the central point of union, where the ſphincter ani touches the accelerator urinæ.

Sometimes more deeply ſeated, and above the laſt, runs a ſlip of fibres, *viz.* the TRANSVERSALIS PERINEI ALTER.

OF THE BLOOD-VESSELS IN THIS STAGE OF THE DISSECTION.

All the ARTERIES ſeen in this ſtage of the diſſection are branches of the pudic artery. The pudic is ſometimes named the EXTERNAL HÆMORRHOIDAL ARTERY; but,

1. Is properly the EXTERNAL HÆMORRHOIDAL ARTERY; which, branching upon the extremity of the rectum, and enveloped in the muſcular fibres, ſurrounds the anus.

2. That artery, which is prolonged by the ſide of the bulb of the urethra, and gives off twigs over the erector penis and crus penis, is the ſuperficial branch of the pudic artery, or the ARTERIA PERINEI.

3. The TRANSVERSALIS PERINEI is a branch from the laſt artery, diſtributed in the cellular membrane, and to the ſphincter ani.

The place of this artery is often ſupplied by ſeveral irregular branches.

The VEINS which are ſeen in this diſſection, are the pudic or inferior hæmorrhoidal veins, and accompany the arteries.

The NERVES which appear in the courſe of this diſſection, are the pudic nerves coming from the ſecond and third ſacral nerves (ſee Camper). They run ſometimes over the tranſverſalis perinei muſcle; more frequently below it; ſometimes they come out in one branch, ſometimes in ſeveral twigs. But the veins and nerves are of leſs conſequence to be ſtudied than the muſcles and arteries.

SECOND STAGE OF THE DISSECTION.

EXPLANATION OF FIG. 2.

To bring the parts to correſpond with the drawing of figure 2. we muſt diſregard the muſcles entirely, purſue the delicate branches of the arteries in a retrograde courſe (diſſecting with the ſciſſars chiefly), till we have cleared the muſcles and cellular membrane entirely away, and have a more connected view of the arteries, with their diſtribution to thoſe more important parts which now come into view.

LEVATOR ANI. In the courſe of this diſſection, we have to obſerve the intricate connections of the levator ani muſcle: It will be ſeen coming down from the neck of the bladder and triangular ligament of the urethra, and from the fibres of the ſphincter veſicæ; and in ſtronger faciculi from the ſides of the pelvis, converging to the anus, and mixing its fibres with thoſe of the internal ſphincter.

A A, TUBEROSITY OF THE OS ISCHIUM.

B B, RAMUS PUBIS.

C, CRURA PENIS.

D, CORPUS SPONGEOSUM URETHRÆ.

E, BULB OF THE URETHRA.

F, PROSTATE GLAND ſeen much retired.

G, MEMBRANOUS PART OF THE URETHRA. In diſſecting which, we have to obſerve, what has been called the triangular ligament of the urethra; it will appear as of a middle nature, betwixt muſcle and tendon, ſurrounding the urethra, and connecting it and the proſtate gland with the arch of the os pubis. It gives ſtrength to the membranous part of the urethra; and being perforated by numerous veins coming from the penis, it has been deſcribed as cavernous.

H, The BLADDER, obſcurely ſeen.

I I, The CELLULAR MEMBRANE interpoſed betwixt the bladder and gut.

K, The ANUS.

L, Os COCCYGIS.

ARTERIES.

1. The ARTERIA PUDICA COMMUNIS.

2. The PUDIC ARTERY, dividing into the PERINEAL, and the deep ſeated branch or ARTERIA PENIS.

3. The ARTERIA PENIS, the diviſion of which into the artery of the bulb is ſeen, and its contortions marked by dotted lines upon the bulb; while the main branch proceeds upon the ſeptum penis, and gives off the arteria dorſalis penis.

4. The EXTERNAL HÆMORRHOIDAL ARTERY.

5. The TRANSVERSALIS PERINEI ARTERY laid back.

6. The ARTERIA VESICALIS IMA going to the neck of the bladder and proſtate gland.

EXPLANATION OF FIG. 3.

In this figure there is a further diſſection of thoſe parts illuſtrating the preceding figures. In the ſubject from which this was drawn, the pelvis and thighs were ſevered from the trunk at the lumbar vertebræ. Ligatures were put upon the femoral arteries to confine the force of the injection to the pelvis. The bladder and rectum were filled with tepid water, and the injection of the veins and arteries made. The muſcles of the thighs originating from the pelvis being cleared away, and alſo the numerous branches of the obturator artery, with the profunda femoris and circumflex arteries, the thigh bones of both ſides were cut through. And further, to give full room for the diſſection of the arteries of the pelvis, and to bring them into a new view, the os ſacrum and coccyx were taken entirely away; the perineum and parts of generation, with their arteries, were then carefully diſſected.

The diſſection was then placed ſo as to illuſtrate the preceding figures.

A B C D E F G H K L, have the ſame references as in figure 2.—But it may be obſerved, that the mouth of the gut K, being pulled downwards, and ſeparated from the bladder H H, is conſequently drawn from its natural ſeat; the proſtate gland F, and urethra G, are more diſtinctly ſeen; while the viſiculæ ſeminales L L, which in the other figures lay hid betwixt the bladder and gut, are brought into view.

M M M, The hæmorrhoidal veins, and branches of the lower meſenteric veins.

N, Congeries of veins ſurrounding the neck of the bladder, chiefly derived from the vena ipſius penis.

In this figure a connected view of the perineal arteries is allowed.

1. A trunk, common in this ſubject to the poſterior iliac artery or gluteal, and to the iſchiatic artery.

2. The POSTERIOR ILIAC ARTERY.

3. The ISCHIATIC ARTERY.

4. The VESICALIS IMA of HALLER. Beſides ſurculi from this artery, the neck of the bladder and proſtate gland has twigs from the middle hæmorrhoidal artery, an artery of the rectum.

5. The PUDIC ARTERY (ſometimes called the inferior hæmorrhoidal) at that place where it appears without the pelvis.

6. The PUDIC ARTERY, where it lies covered by the tuberoſity of the iſchium.

DISTRIBUTION OF THE PUDIC ARTERY.

7. EXTERNAL HÆMORRHOIDAL ARTERY.

8. PERINEAL ARTERY.

9. TRANSVERSALIS PERINEI.

10. The ARTERIA PENIS, the diviſions of which cannot now be ſeen:—Theſe, however, go to the bulb (the extremities of which are ſeen at 11)—to the body of the penis—to the cavernous body of the urethra.

12. The CORONARY VEINS of the neck of the bladder.

INFERENCES DRAWN FROM THESE SEVERAL VIEWS OF THE PARTS.

OF THE ACTION OF THE PERINEAL MUSCLES.—There is no combination of muſcles more curious, or more deſerving of our attention, than that of the muſcles of the penis and rectum; whether we conſider

Plate X.

Fig.e 1.

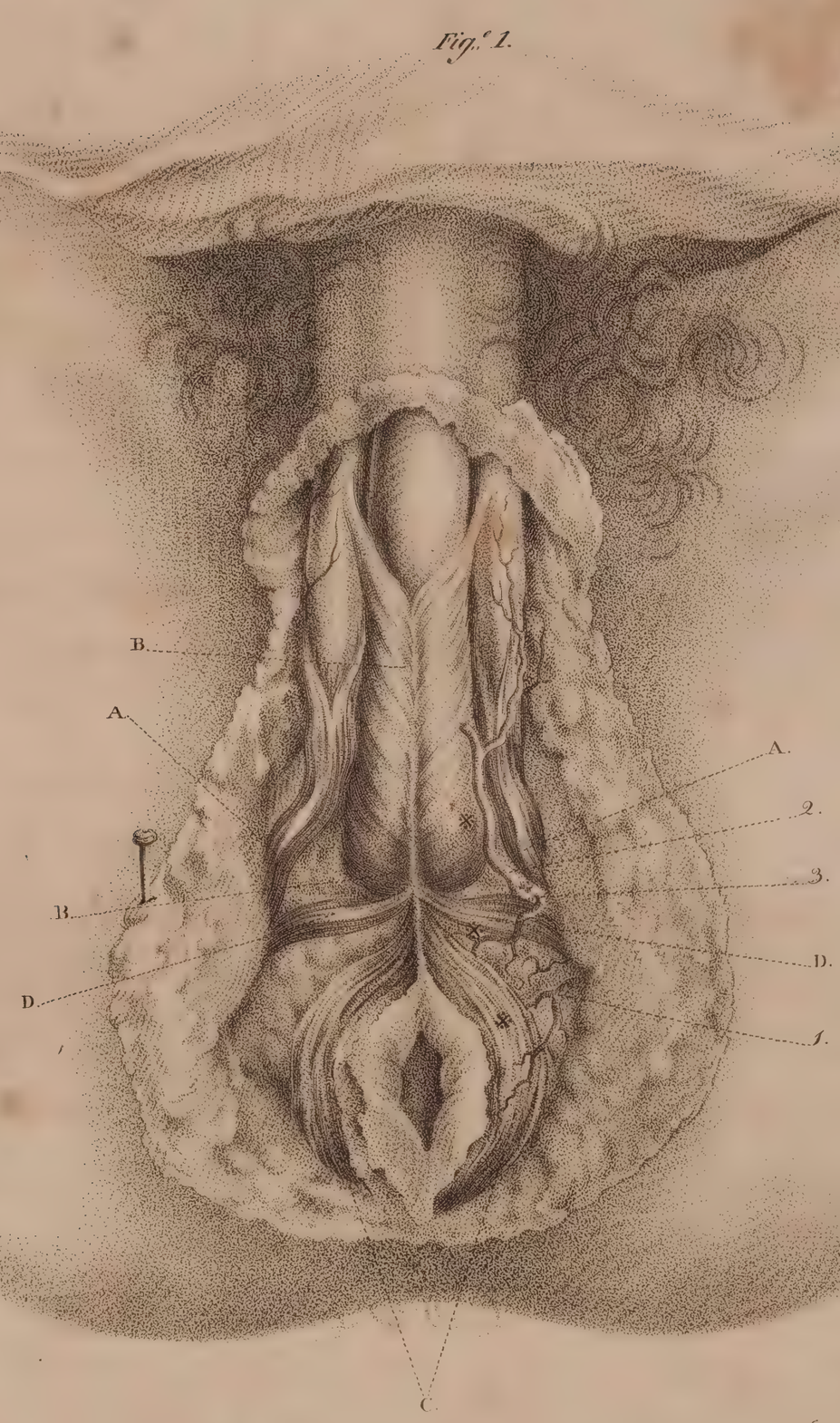


Fig. 2.

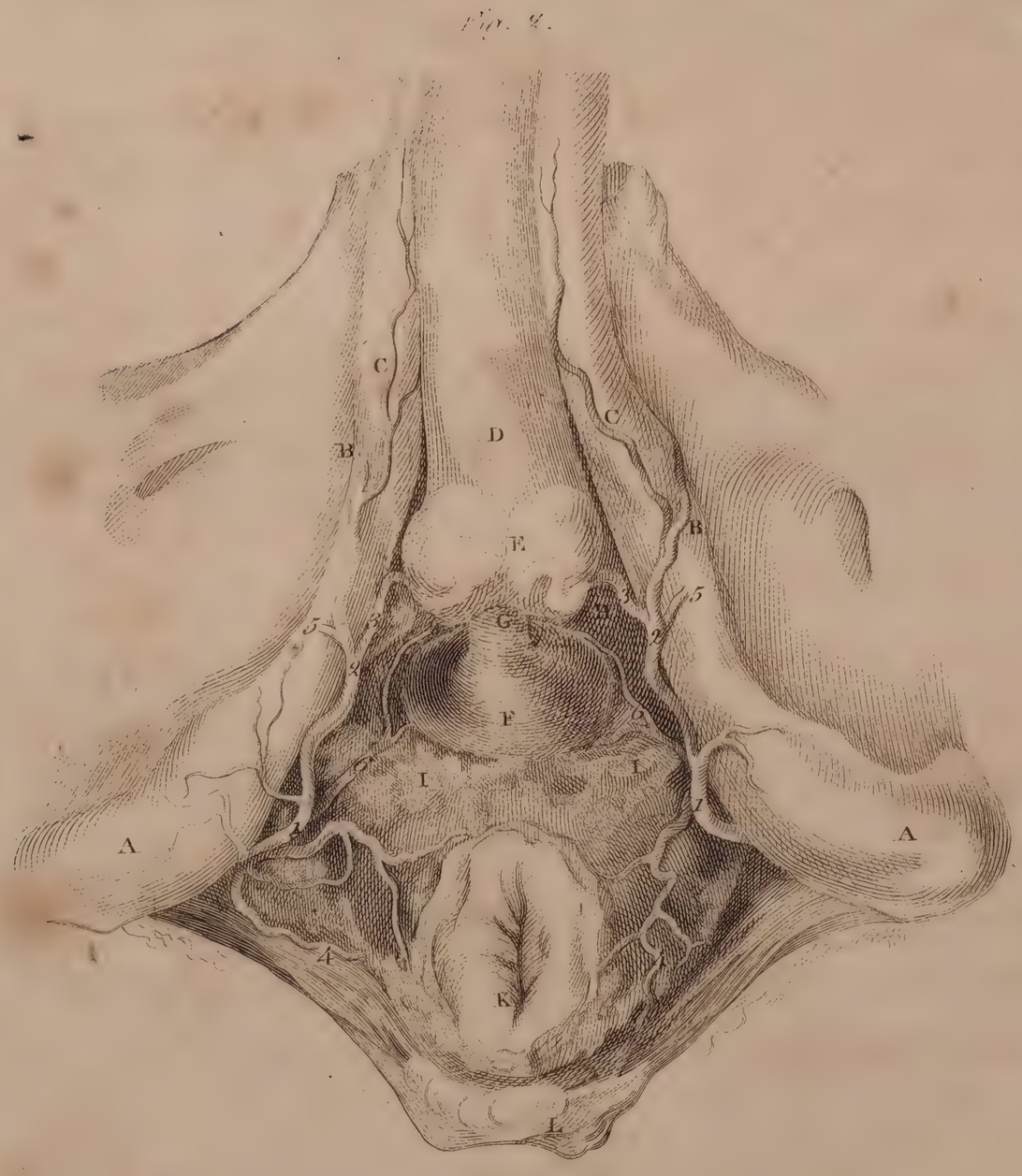
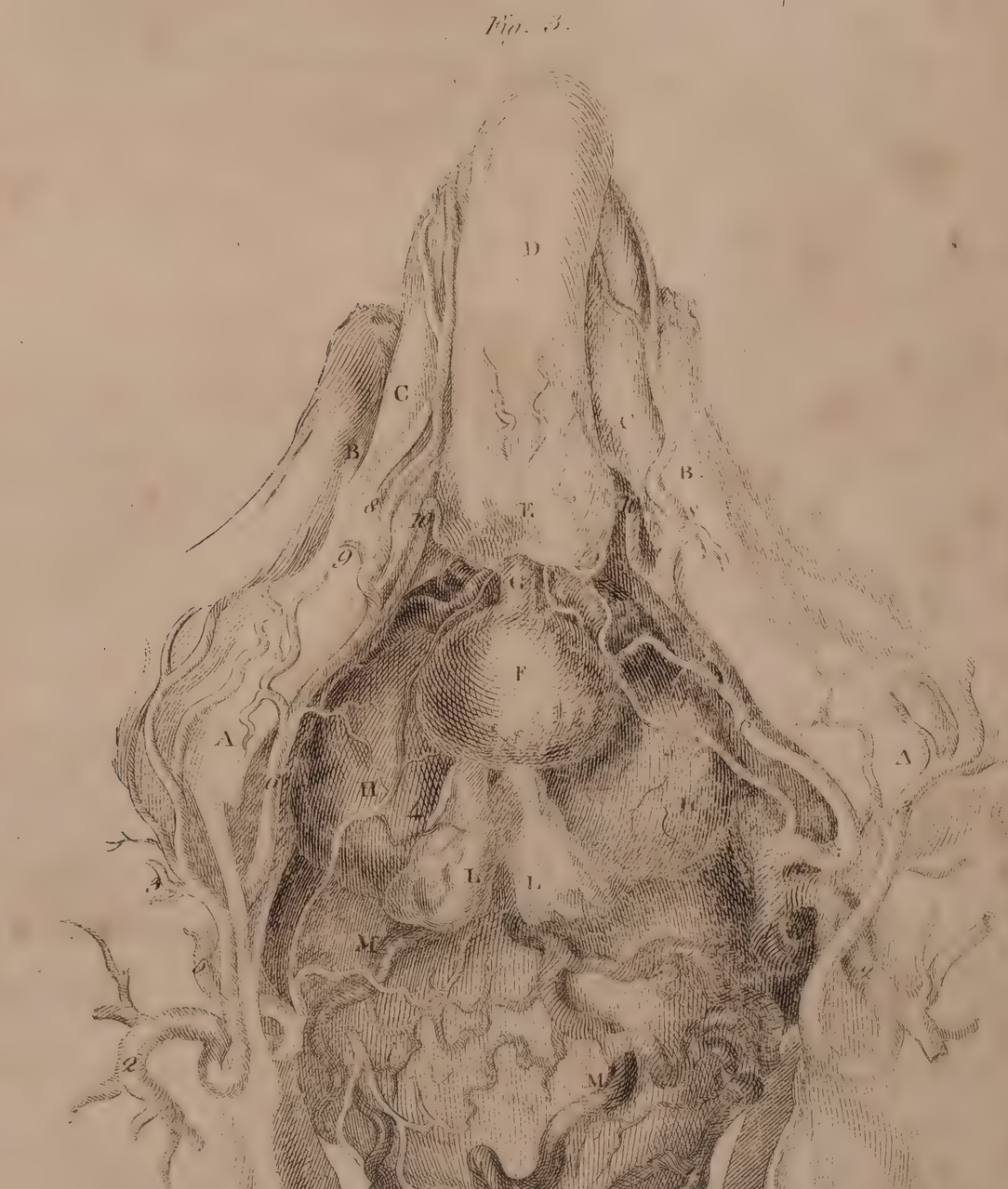


Fig. 3.



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the importance of the organs to which they are ſubſervient, or the diſeaſes with which they are connected: —yet both the natural action of thoſe muſcles, and their action and ſympathies in the morbid ſtate of the parts, have been much neglected; and the uſes or actions attributed to them are ſurely very far from the truth.

Of the erector penis.—Is it not more natural to conceive that the uſe of this muſcle is to brace the crura penis to the bone, than to adopt that explanation of its action which has gained it its preſent name? Can we conceive any mechaniſm ſo well adapted to give firmneſs and occaſional ſtrength to the hold which the root of the penis muſt have upon the bone, as that of a muſcle partaking of the ſame ſtimulus; inert when the penis is flaccid, and rouſed to action in proportion to the excitement of the penis?—To ſuppoſe it aſſiſting the dilatation of the penis, by forcing the blood forward from the crura, is to attribute to it an action which would totally prevent erection, and not give firmneſs; the blood being excluded from the crura, could have no hold upon the os pubis. And the idea of its holding down the penis is (in ſpite of authority) ridiculous; ſince the pubes or adipoſe membrane betwixt the dorſum penis and os pubis, prevent further elevation, and render ſuch an action in this muſcle unneceſſary.

Accelerator urinæ.—To underſtand the action of this muſcle, we muſt recollect the relations of the bulb and lower portion of the cavernous body of the urethra upon which it acts. The corpus cavernoſum urethræ is a ſpongy body, ſurrounding the urethra from its membranous part under the arch of the os pubis to the glans. The glans is the enlargement of this body towards the extremity of the penis, whilſt its lower part in the perineum is alſo enlarged to form the bulb. Within this lower part the canal of the urethra is dilatable into what has been called the sinus urethræ. Now this is ſtrictly the operative part of the penis, and is raiſed upon the firmer ſupport of the body of the penis, which alone by its crura, has a firm hold of the os pubis. When the glans is excited, the whole parts of generation are brought into action:—the veſiculæ ſeminales more gradually empty themſelves into the urethra; when the accelerator, being drawn into action, propels their contents forward by ſucceſſive pulſations. It may be obſerved, too, that this action upon the bulb, though partial, affects the whole extent of the cavernous body of the urethra, and has the effect of ſtrengthening and making rigid that canal, ſo as to increaſe the velocity of the emiſſion.

The erector and accelerator muſcles are the only ones which can be conceived to have an independent action; and the accelerator is very ſtrictly connected with the tranſverſalis and ſphincter ani. In that action of the accelerator which has been noticed, the ſpincter ani, the tranſverſalis perinei, and the levator ani, have a ſimultaneous action. The two firſt retain and ſteady the bulb of the urethra againſt the action of the accelerator; whilſt the levator ani, and muſcular fibres about the neck of the bladder, compreſs the veſiculæ, and, conſtricting the urethra, prevent a retrograde movement of the ſemen.

Beſides the action of aſſiſting the muſcles of generation, the ſphincter, tranſverſalis, and levator ani muſcles, have the peculiar action of guarding the outlet of the pelvis; and give to the contents of the pelvis firmneſs and a degree of ſupport, enabling them to preſerve an equilibrium with the parts in the belly.

Diseased action in these parts affecting the discharge of semen.—Whilſt treating of the action of theſe muſcles, the diſeaſes with which they are connected form an important object; for though they are of rare occurrence, they are very intereſting. An increaſed ſecretion from the veſiculæ ſeminales, or proſtate gland, is frequently a cauſe of terror to patients, when there really is no diſeaſed ſecretion of the ſemen.

In an inſtance of retention of the ſemen, theſe are the ſymptoms: "Ni ce fremiſſement ni cette ſenſa-

tion ne ſe ſoutenoitent pas auſſi long tems. La ſemence ne ſortoit qu'en forme de bave, et a meſure que l'erection diminuoit (A)." We may explain ſuch ſymptoms thus: The ſemen was not thrown retrograde into the bladder; for in that caſe it would have been evacuated only by an effort to make urine; but there being ſuch an obſtruction as to retard the veſiculæ ſeminales from diſgorging themſelves ſuddenly into the urethra, ſo as to diſtend and ſtimulate the accelerator muſcle, the ſemen remained ſlowly moving through the urethra: or, what is more probable, the erection of the penis and ſpaſmodic contraction of the muſcles were ſuch as to obſtruct the paſſage of the ſemen until the relaxation of all the parts; a diſeaſe in which our expectation of relief is much better founded, than when there is an obſtruction in the canal of the urethra. Much the ſame ſymptoms, I believe, are the conſequence of ulcers having partially deſtroyed the accelerator muſcle, when the power of expelling the ſemen from the ſinus urethræ is loſt.

Where the ſemen, inſtead of being thrown forwards, really falls backwards into the bladder, it may be difficult to ſay whether it may be owing to a relaxation of the muſcular fibres ſurrounding the neck of the bladder, allowing to the ſemen a retrograde movement into the bladder, or whether it be owing to an obſtruction before the verumontanum. The former is more likely, ſince ſuch a retention of the ſemen is not accompanied with any interruption of the natural diſcharge of urine.

But there is a circumſtance which may ſtill farther explain the peculiarity in the evacuation of the ſemen: Whilſt it flows, the ſtate of the parts muſt be recollected, the tenſion, the fulneſs, during the venereal orgaſm. In this ſituation of the parts, any caruncle or prominent obſtruction ſuffers a kind of erection, whilſt the canal is at the ſame time ſtraitened by the erection. This may explain a circumſtance which occurred in a caſe where the ſemen was thrown back into the bladder. The patient could not evacuate the urine for ſome time; and when, after a few minutes, it flowed, the ſemen was found ſettled in the chamber-pot. It has happened frequently, that mucus evacuated by ſtool in teneſmus has alarmed patients much, in a diſeaſe of this nature; as they immediately conceive this to be the ſemen coming by ſome ſtrange preternatural paſſage.

In ſtricture of the urethra, where the urine flows with difficulty, it is curious that the ſemen is diſcharged naturally. But we muſt make a diſtinction betwixt an obſtruction to the ſemen before it reaches the accelerator muſcle, and one ſituated betwixt that muſcle and the glans. Beſides, the urethra in erection of the penis is much ſtraitened and elongated; ſo that a ſtricture, which is firm and callous, and not apt to be affected by the fulneſs of the parts, ſhould give comparatively little reſiſtance, eſpecially when we conſider that the ſtretching of the urethra by erection (which we endeavour to imitate in introducing the catheter) will in a greater meaſure counteract the ſtricture.

In that affection of theſe parts which is conſidered as SEMINAL WEAKNESS, an attention to their action and importance in the economy will perhaps explain the nature of the diſeaſe. I ſhould conceive, that the veſiculæ ſeminales receive the ſemen, not ſtrictly as reſervoirs; but that in theſe veſſels it may be mingled with their peculiar ſecretion, ſo as to form, when diluted, a quantity of fluid fitted to be acted upon by the muſcles of generation. Were the ſemen poured only from the vaſa deferentia, there would be too ſmall a quantity of fluid to be acted upon; nor would there be the ſame chance, nay, ſcarcely the poſſibility, of impregnation. We know, that the prolific power of the ſemen is not leſſened by dilution; and indeed we are aſſured, that by the violent excitements of the parts, the proſtate gland and all the mucus glands of the urethra contribute their ſecretions. By dwelling upon this, it is meant to point out the diſtinction betwixt thoſe affections of the parts which are conſidered as ſeminal weakneſs, and any real affection of the teſticle. Slight inflammations of theſe parts, weakneſs, or loſs of tone, the diſcharge from the urethra, or gleets communicating with the veſiculæ ſeminales or proſtate glands, will produce

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(A) See Mem. de l'Acad. de Chirurgie.

an increaſed ſecretion, a permanent or temporary laxity and debility of the ſecreting parts; and their contents being accumulated, will be thrown out in ſtraining at ſtool, or in the expulſion of the laſt drops of urine, without implying any peculiar affection of the ſecretion of the teſticle, or any more general debility of the ſyſtem.

Of action in the rectum.—We ſhall perhaps come to admit, that a relaxation takes place in the ſphincter ani, if we conſider the manner in which the inteſtinal canal acts through its whole length. One portion of the gut being in action, propels its contents to that which is below, and which, relaxing, receives them. Were there not a relaxation in the lower portion, it would oppoſe itſelf to the contraction of the upper part.

In the ſame manner, the ſuperior ſtrength of the muſcular fibres, ſurrounding the extremity of the rectum, is relaxed during the action of the rectum, which allows an eaſier expulſion of the fæces:—as, by a law of nature in parturition, not the muſcular parts only, but the whole parts, are relaxed previous to their dilatation. It is from this peculiarity in the action of the rectum that I would explain the formation of piles in ſome inſtances, and the prolapſus ani. Irritation of the gut gives occaſion to an almoſt imperceptible but conſtant effort to expel from the rectum; and this effort is attended with a relaxation of the lower part of the gut and of the muſcles, which, in action, retain the parts, and counteract the preſſure of the abdominal viſcera and the occaſional action of the abdominal muſcles. By continued action of this kind (the uſual tenſion being taken off), the parts ſwell by the influx of blood; the internal membrane is inflated with blood, and protruded, forming a ſpecies of the hæmorrhoes. The ſame explanation holds good in violent ſtraining at ſtool in coſtive habits; and it ſhould be recollected at the ſame time, that the contraction made higher in the rectum, may more eaſily retard the returning venous blood than the more active play of the hæmorrhoidal arteries, thereby cauſing a ſtagnation of the blood in the extremities of the veins.

Of intus-susceptio and prolapsus ani.—In the ſame manner we have to explain intus-ſuſceptio and prolapſus ani. In the firſt inſtance, the gut being irritated at any point, the irritation cauſes a contraction, while in the ſuperior portion of the canal there is an effort to propel downwards: the conſequence is, that the portion contracted by the irritation is forced to ſlip into the lower portion of the canal. But how is it forced into the lower portion? this is not well explained. It appears evident to me, that this is the effect of the longitudinal muſcular fibres; for a portion of the inteſtine, ſay ſix inches, being irritated, contracts. This contraction is not in the diameter of the gut only, but in its length, ſo that it ſhall be only of two or three inches; the conſequence of which is, that the internal coats are gathered together and inflated, and preſſed into the next portion of the gut; by this the contraction is increaſed and the diſeaſe continued. In irritable childhood this often happens; and I have frequently found upon opening children, that there were involutions of the gut without inflammation or adheſion, but which might be withdrawn by the mere weight of the inteſtine.

In prolapſus ani, that laxity of the internal membrane, which is the immediate cauſe, is frequently produced by irritation; and the internal membrane being firſt protruded, the effort of expulſion being continued, the irritation increaſes, and a great part of the gut is inverted. When this accompanies dyſenteric affections or diarrhœa, where there has been violent teneſmus and bearing down, it is a moſt diſtreſſing ſymptom, eſpecially when the counter indications prevent the proper remedies. In caſes where there is local irritation (as from numerous aſcarides in the rectum of children, or, as ſometimes happens, from the ſtone in the bladder), the temporary or permanent relief from the irritation muſt be the firſt object, while aſtringents are applied to counteract the effect of the loſs of preſſure. The reduction is commonly accompliſhed without difficulty by a ſtrong cone of paper ſoftened (by moiſtening at the point) and

oiled. This is to be introduced into the gut with gentle but continued preſſure; and when the gut is completely reduced within the anus, the cone is eaſily withdrawn, with little riſk of its bringing down the inteſtine again.

In violent irritation of the rectum, as in long continued teneſmus of dyſentery, the neck of the bladder ſympathizes; and what produces relaxation in the gut cauſes a ſtranguary, or ſpaſmodic conſtriction in the neck of the bladder. This we ſhall readily conceive, when we recollect the ſtrict relation which ſubſiſts between the action of the rectum and of the muſcles about the neck of the bladder in their healthy action. The ejection of the contents of both is not allowed at the ſame time, but requires an alternation of action; which certainly is in a great meaſure to be accounted for from the communications of the levator ani, ſince this muſcle, ariſing from the brim of the pelvis, ſends its fibres down upon each ſide of the neck of the bladder, and embraces it before it reaches the lower portion of the gut, into which it is finally inſerted.

It may be obſerved here, that in all ſuch protruſions, whether hærnia or prolapſus ani, the moſt immediate bad conſequence is the want of accuſtomed preſſure upon the protruded part, which cauſes fulneſs and ſtagnation of blood. In prolapſus, the contraction of the ſphincter and levator ani tend to increaſe the evil, by drawing like a ligature upon the protruded gut (B).

It is by ſuch a view of the parts as we have in fig. 2. that we come to have a truer idea of the ſtrict relation which they have to each other, of their ſympathies in diſeaſe, and of what we ſhould expect to feel in a morbid ſtate upon examining by the anus. Thus in inflammation of the neck of the bladder, or enlargement of the proſtate gland, the pain in making water—the frequent excitement to it—the pain ſtretching upwards to the kidneys, and extending along the penis to the glans—the pain upon preſſure in the epigaſtrium—the ſenſation in the rectum of a tumor, or of fæces ready to be expelled (which is occaſioned by the ſwelling of the proſtate gland);—do in ſome meaſure recapitulate to us the anatomy and ſympathies among the parts.

The ſtudent, in diſſecting theſe parts, ſhould naturally be led to inquire concerning the direction of abſceſſes which ſo frequently run amongſt the cellular ſubſtance; of ſuch particularly as may be connected with the urinary organs, the urethra, or neck of the bladder; and of the fiſtula in ano, or ſuch as run up by the ſide of the rectum.

Theſe abſceſſes, forming amongſt the cellular membranes, become habituated and ſtationary; being long callous canals, which, by the condenſation of the ſurrounding parts, acquire a ſmooth internal ſurface, and from which there is a perpetual diſcharge of matter. They are with difficulty brought to have any tendency to heal; and ſometimes communicating with the gut, teaſe the patient with a local irritation in the rectum, and waſte him with collequative diarrhœa.

Although theſe abſceſſes amongſt the fat and cellular membrane, in the bottom of the pelvis, are in general connected with the rectum, or have a tendency to open into it, a diſeaſe as dangerous is formed by the connection of theſe with the urethra. Not only thoſe formed forwards in the perineum, will have formed fiſtulous communications with the urethra, but thoſe formed about the anus will ſtretch towards the urethra, deſtroying the cellular ſubſtance which ſurrounds it.

We ſee evidently, from the numerous arteries here, how liable we may be to miſtake the moſt common indurated tumor for an aneuriſm, having a diſtinct pulſation communicated to it by its contiguity to theſe veſſels:—yet we have reaſon to be aſtoniſhed, that aneuriſm of theſe veſſels is not frequent, more eſpecially in the female pelvis, where the parts are ſo liable to diſeaſe, and where they are ſubjected to occaſional preſſure, dilatation, or ſudden relaxation.

(B) The conſideration of the diſeaſes of theſe parts is reſumed in a ſubſequent Section.

Of lithotomy.—Upon turning our attention to fig. 1. we find, that the external inciſion in lithotomy muſt run in the direction (***) upon the left ſide of the perineum, cutting directly through the tranſverſalis muſcle, cutting a few fibres of the ſphincter, and going deeper, or more penetrating in the middle, ſo as to reach into the membranous part of the urethra. In laying open the groove of the ſtaff, it is very awkward to cut the bulb of the urethra. It nevertheleſs does ſometimes happen, that it is not cut only, but minced with many tranſverſe cuts. And authors mention a more diſtreſſing circumſtance ſtill, viz. the blood having been ſeen flowing from the anus, in conſequence of the inciſion having been carried too low upon the gut, and the gut and hæmorrhoidal veſſels cut.

It is a more frequent, and very embarraſſing accident, when the pudic artery is cut by carrying the knife too near the bone: the veſſel muſt be tied before proceeding. When the perineal artery is cut (and indeed it can hardly eſcape) it does not, in general, interrupt the operation.

Some or all of theſe veſſels bleed in the operation of lithotomy, and choke up the wound with coagulating blood; ſo that the operation muſt be done much more in the dark than we ſhould conceive from the view of the diſſected parts.—And this ſhould teach us how neceſſary a ſtrong conception of the anatomy is; not ſimply ſuch an idea as can enable us to diſſect the parts, but a knowledge of the feel alſo of the different parts, ſo as to be able to diſtinguiſh them by the finger.

A thickened and indurated ſtate of the bladder has been a frequent cauſe of the failure of this operation: For although, when the gorget is ſaid to have gone betwixt the bladder and rectum, it is generally conceived that the operator, in his hurry and trepidation, has never fairly cut the urethra and groove of the ſtaff, but has paſſed his gorget onwards, unguided, amongſt the cellular ſubſtance; this certainly has happened; yet it would appear as likely, that in this caſe the bladder had been puſhed forwards upon the ſtaff by the gorget, without the inſtrument having penetrated the bladder, or cut through the proſtate gland.

OF THE SECTION OF THE PELVIS.

EXPLANATION OF PLATE XI. Fig. 1.

In the rude plan of the ſection of the pelvis given in Plate XI. fig. 1. and which is taken with little variation from Camper, it is ſuppoſed to be cut by the ſymphyſis of the os pubis (A), and the ilium (B) at an equal diſtance betwixt its ſymphyſis with the ſacrum and the acetabulum. We muſt be aware of the confuſion of parts which this preſents, and that it is a tedious and difficult diſſection clearly to demonſtrate all the parts; the bladder, urethra, proſtate gland, veſiculæ ſeminales, ureters, and rectum, with their connections, even without their blood-veſſels, and to retain them in their natural ſituation.

A, The os pubis divided by its ſymphyſis.

B, The os ilium divided.

C, The corpora cavernosa penis.

D, The urethra, ſurrounded with the corpus cavernoſum urethræ.

E, The scrotum.

F, The bulb of the urethra.

G, The membranous portion of the urethra. In diſſecting here, we have to obſerve the ligamentous ſubſtance ſurrounding and ſtrengthening it, and how it is embraced by the ſphincter veſicæ.

H, The bladder, as deſcribed by Camper, falling into a triangular ſhape, the baſe of which reſts upon the rectum. The muſcular fibres of the bladder are very formally repreſented by Albinus, inſerted into

the os pubis. CAMPER cannot diſtinguiſh this inſertion. The drawing of ALBINUS would miſlead us; ſince no ſuch regular muſcle is to be ſeen, and ſince the muſcular fibres are looſe and irregular, and involved in the connecting cellular membrane: But ALBINUS, in as much as relates to the origin and inſertion and general direction of the fibres, is invariably true.

I, The PROSTATE GLAND, which muſt be felt, not ſeen, amongſt the confuſion before diſſection.

K, The VESICULÆ SEMINALES attached to the lower part of the bladder, immediately behind the proſtate gland.

L, The RECTUM, taking the courſe of the os ſacrum and os coccygis.

M, The CONVOLUTIONS of the INTESTINES in the lower part of the belly.

N, The ANUS.

O P Q, A dotted line, repreſenting the courſe of the peritoneum. O, where it covers the abdominal muſcles and pubes;—P, where it is reflected upon the bladder;—Q, where it turns over the rectum, and forms its outer coat.

REVIEW OF THE PARTS AS SEEN IN THE SECTION OF THE PELVIS.

The BLADDER is, upon the upper and back part, covered with the ſmooth expanſion of the peritoneum;—on the lower and fore part, and contiguous to the lower portion of the rectum, it is imbedded in cellular membrane, in which abſceſs makes rapid progreſs. The bladder upon diſtention riſes before the inteſtines M, M, keeping cloſe to the pubes (A), and carrying the peritoneum (O, P,) before it; ſo as, when much diſtended, to appear above the os pubis, and to allow of its being punctured, or even to permit the performance of the high operation for the ſtone without piercing the peritoneum. As it riſes, however, the lower part of the bladder does not proportionally protrude, but rather (in the ſubject) retires from the perineum as the bladder fills.

During diſſection, the place and degree of curve of the urethra ſhould be carefully obſerved, as of the laſt importance, in all operations in the perineum. It may be obſerved how ſtrongly the membranous part of the urethra, or that portion of it which is betwixt the bulb of the urethra and the proſtate gland, is ſupported by the faſciculus of fibres or ligamentum triangulare, and how much diſſection it requires to ſhow its membranous nature. In the healthy ſtate of the parts, it ſeems almoſt impoſſible that ſuch rudeneſs ſhould be employed as to rupture the urethra with the catheter; yet this happens in the diſeaſed ſtate of the parts. Such an accident, however, is more frequently the conſequence of continued preſſure of bougies; which being with difficulty directed in the curve of the urethra, make their way into the interſtice filled with cellular membrane (R), betwixt the neck of the bladder and rectum, and ſometimes into the rectum itſelf; forming a conſtant draining of urine into the rectum, and exciting in conſequence perpetual diarrhœa and teneſmus.

The PROSTATE GLAND (I), which is ſeen ſurrounding the neck of the bladder, when ſwelled by any of the cauſes enumerated below, compreſſes the canal of the urethra: but a more complete obſtruction to the introducing of the catheter ariſes from its ſwelling irregularly, or puſhing forwards, ſo as to increaſe the ſudden curve of the urethra, or to ſhift it aſide. In the ſame manner, tumors, or even abſceſſes, by diſtorting the urethra, cauſe difficulty of paſſing urine. We ſee an inſtance of the diſtortion of the urethra cauſing retention, where the bladder is contained in the hernial ſac. But in this caſe, much of the difficulty of paſſing urine ariſes from a degree of weakneſs in the bladder itſelf, and from its alſo having loſt the co-operating preſſure of the abdominal muſcles.

This outline of the ſection of the pelvis may illuſtrate another circumſtance much dwelt upon by Camper, viz. the point of the catheter being prolonged too far beyond that part of its curve which ſhould be

adapted to the curve of the urethra:—the conſequence of this is, that when it is fully introduced, the point reaching the back part of the bladder puſhes it before it; and the coats of the bladder, clinging round the catheter, prevent the urine from flowing; or if the inſtrument be continued in the bladder, there is great riſk of the bladder being hurt by the point of the inſtrument. Caſes have occurred of its making way into the rectum.

It may be obſerved, too, how much of the bladder is, in ſounding, under the curve of the ſtaff; how a ſtone gravitating into the lower part may be over-reached by the ſtaff or catheter, and no grating be felt but by forcing the convexity of the ſtaff downwards in ſounding. The ſtone falling into this more depending part of the bladder, in the prevailing poſture of the body, may form a lodgment there. This would undoubtedly more frequently happen, did the bladder always retain its natural pliancy and thinneſs of its coats; but the conſequence of the preſence and irritation of a ſtone in the bladder is a thickening and contraction of the coats, which muſt prevent the formation of cyſts.

In puncturing the bladder from the rectum, independently of the very awkward circumſtance of the canula remaining in the inteſtine, the proximity of the ſeat of diſeaſe (in the neck of the bladder or proſtate gland) becomes a great objection. We ſee alſo, from the plan, how in this operation the proſtate gland being enlarged it may be miſtaken for the bladder, and the trocar plunged into its ſolid ſubſtance, ſo that no urine can flow upon withdrawing the ſtilet.

In puncturing by the perineum alſo, we muſt recollect, that if the diſeaſe be in the proſtate gland, it is enlarged, ſo that there is a great probability that the trocar ſhall be paſſed into the ſubſtance of the gland, without penetrating into the bladder.

I have ſeen an inſtance of the trocar in this operation having paſſed through the urethra: upon withdrawing the ſtilet no urine flowed from the canula, becauſe it had transfixed the urethra (which had been dilated behind the obſtruction); but upon withdrawing the canula a little, and freeing it from the oppoſite ſide of the urethra, the urine flowed in full ſtream. The canula upon this was further introduced again; but, inſtead of taking its former direction, it ſlipped along the urethra, and found its way into the bladder by the natural paſſage. This appeared upon the diſſection.

In the ſubject, or in the annexed plan, we ſee how the bowels preſs down into the pelvis in the erect poſture of the human body: but we may obſerve alſo, how the viſcera of the pelvis, being more firmly connected by cellular membrane and conſtricting muſcles, ſupport the weight of the abdominal viſcera; that, by the combined power of the perineal muſcles, levator ani, coccygeus, and iliacus internus muſcles (the antagoniſts of the abdominal muſcles and diaphragm), the prolapſus of the parts is prevented; yet we can conceive in the female pelvis a hernia of ſome of the inteſtines, betwixt the vagina and rectum, forming a tumor puſhing down from the vagina; or here ſometimes a hernia may inſinuate itſelf betwixt the bladder and os pubis getting acceſs to the thyroid hole; nay, there are even inſtances of hernia protruding upon the hip from the ſacro-iſchiadic hole.

VIEW OF THE PELVIS FROM BEHIND; BEING AT THE SAME TIME A RECAPITULATION OF THE PRECEDING VIEWS OF THE PARTS.

EXPLANATION OF PLATE XI. FIG. 2.

In this ſubject, after a minute injection of the pelvis, the os ſacrum was taken away; the rectum alſo was diſſected away, that the bladder might be ſeen from behind, and a more comprehenſive view allowed of the diſtribution of the INTERNAL ILIAC ARTERY. The branching of the arteries here are not what will be conſidered as regular; but it is better to take ſuch natural diſtribution, though not perfectly regular, and draw accurately, while the more general diviſion of the branches are thrown into a ſcheme.

A A, Ossa ilia.

B, Acetabulum.

C, Tuberosity of the os ischium.

D, The bladder of urine distended.

E, The ureters.

F, The bulb of the urethra.

G, The prostate gland.

H, The membranous part of the urethra.

I, The vas deferens.

K, The vesiculæ seminales, as they appear in a boy when injected with mercury.

ARTERIES.

1. The aorta; the rectum having been dissected out from betwixt it and the bladder.

2. The common iliac arteries.

3. The external iliac artery going to the thigh.

4. The internal iliac or hypogastric artery.

5. The ilio-lumbar artery.

6. The hypogastric artery, or umbilical artery of the fœtus, pervious now only so far as to supply arteries to the bladder.

7. The pudic artery (or external hemorrhoidal) coming off in the same trunk with the last.

8. The thyroid artery.

9. A branch from the thyroid artery penetrating the bone.

10. A trunk common to the gluteal and ischiadic arteries.

11. The gluteal artery, or iliaca posterior, where it comes out from the pelvis, branching largely on the back part of the os ilium.

12. The ischiadic artery.

To demonstrate these two last arteries is an important dissection, which will be more dwelt upon in that part which contains the dissections of the thigh.

13. A branch going to the gluteal muscles and great schiadic nerve, and from which one of the lateral sacral arteries goes off.

14. A branch from the umbilical artery to the bladder, anastamosing with others upon the upper part of the bladder.

15. Vesicalis ima.

16. Sacræ latterales cut short.

Branches of the pudica communis in the perineum.

17. Deep seated branch of the perineal artery.

18. Superficial branch or arteria perinei.

19. Hæmorrhoidal veins going to the skin and fat about the anus.

Fig. 1.

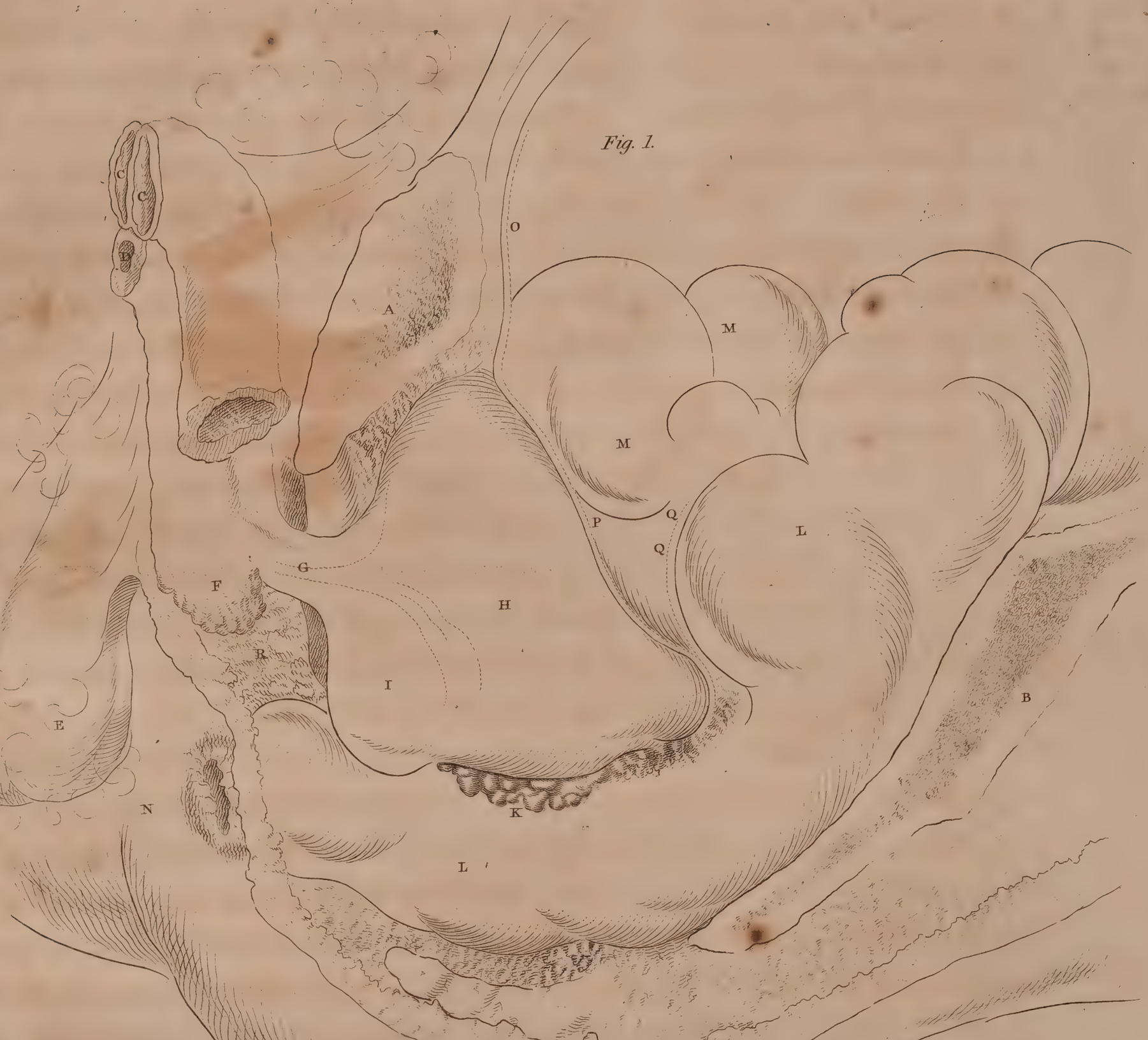
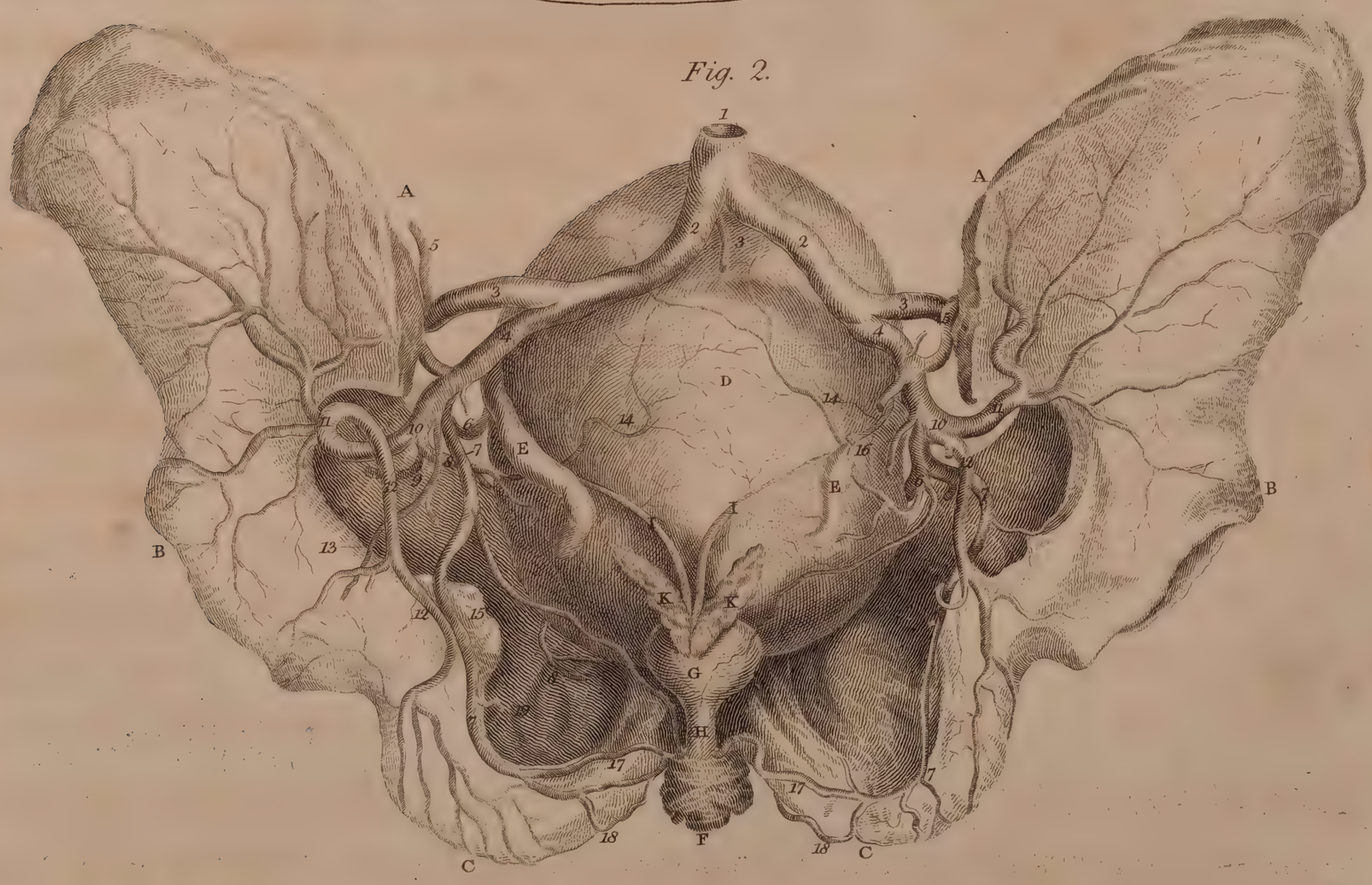


Fig. 2.



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SCHEME OF THE ARTERIES OF THE PELVIS.

AORTA.

Sacra media.—ILIACA COMMUNIS.—Lumbalis ima.

Iliaca externa.—ILIACA INTERNA or hypogaſtrica.

While the external iliac goes down to the thigh, the internal iliac gives off the following branches:

Obturator; which ſometimes gives off the ilio-lumbalis.

Iliaca poſterior gives off { Sacræ laterales, / Ilio lumbalis, / Obturator, } ſometimes.

Iſchiadica; which ſometimes gives off the Obturator.

Pudica; giving off { Veſicalis ima, / Arteria proſtata, / Hæmorrhoidea media; this frequently from the hypogaſtrica. / Hæmorrhoidea externa. / Arteria perinæi—Tranſverſalis perinæi. / Arteria penis.

Umbilicalis; in the female giving off { Arteria uterina. / Ramus ad veſicam. / Hæmorrhoidea media—branching to the { Rectum, / Vagina, / Bladder.

ANOTHER ARRANGEMENT.

Internal iliac.

Gluteal.	Iſchiadic.
Ilio lumbalis, ſacro lateralis.	Umbilicalis, pudica, obturator.

SCHEME OF THE ARTERIES OF THE RECTUM.

The ſuperior hæmorrhoidal artery, which is the deſcending branch of the inferior myſenteric.

The middle hæmorrhoidal, from the pudic artery within the pelvis.

The external hæmorrhoidal, from the pudic artery, where it appears without the pelvis, Plate X. fig. 3. 5.

OF THE DESCENT OF THE TESTICLE; OF THE MANNER OF DISSECTING; AND OF THE DISEASES ILLUSTRATED BY THIS PIECE OF ANATOMY.

The deſcent of the teſticle in the fœtus is, in a phyſiological light, extremely curious, and almoſt inexplicable as a piece of anatomy. It is with ſome difficulty comprehended at firſt, but worthy of our utmoſt

attention, as illuſtrating many important diſeaſes; hernia, hydrocele, and all diſeaſes of the teſticle, chord, and abdominal ring.

EXPLANATION OF PLATE XII.

I ſhall here endeavour to throw together the explanation of the figures and of the method of diſſecting. In a recapitulation, I ſhall point out the circumſtances chiefly worthy of inveſtigation, and the complication of the more ſimple anatomy in hernia, hydrocele, &c.

FIG. 1.—This was a diſſection of a fœtus of ſeven months; at which time, in general, the teſticle will be found adhering juſt without the ring, as was the caſe in the other groin of this ſubject. The angular flap of the abdominal muſcles of the right ſide being laid down over the thigh, the inteſtines removed, and the ring of the abdominal muſcles diſſected, the parts appear thus:

A, The BLADDER pulled aſide by a ligature upon the umbilical arteries.

B, The UMBILICAL or HYPOGASTRIC ARTERY of the right ſide.

C, The RECTUM. Both the bladder and rectum, it may be obſerved, ſtand high and almoſt out of the pelvis, the whole contents of the pelvis falling lower in the adult.

D, The PENIS.

E, The SCROTUM as yet without the teſticle.

F F, The ABDOMINAL MUSCLES.

G, The BODY of the TESTICLE.

H, The EPIDIDYMIS. The teſticle is here approaching the ring; having deſcended from its priſtine ſituation immediately below the kidney and upon the pſoas muſcle.

I, The SPERMATIC ARTERIES and VEINS, and (as may be ſeen in fig. 2.) without either the vas deferens or the cremaſter muſcle.

K, The GUBERNACULUM TESTIS covered by the peritoneum.

L, The PERITONEUM, diſſected off the abdominal muſcles F F.

M, The PROCESS of the PERITONEUM, which, being prolonged through the ring of the abdominal muſcles, is loſt among the cellular ſubſtance in the groin N.

I hope it will be ſufficiently underſtood how the teſticle G is ſaid to be without the peritoneum, *i. e.* behind it; for it lies at preſent in the ſame circumſtances with regard to it as the rectum.—C, the peritoneum, being ſtretched over its fore part, and adhering to its ſubſtance, forming the TUNICA ALBUGINEA. The teſticle ſtill continuing its deſcent, by the ſhortening of the Gubernaculum K (ſee more diſtinctly fig. 2.); and the inflections of the peritoneum ſtill retaining their relation to the teſticle, it falls gradually into the ſac N, which becomes thus a ſecond coat to the teſticle, the VAGINAL COAT. As the ſurface of the peritoneum retains its lubricating ſecretion, theſe two coats do not adhere, but the outer or vaginal coat ſimply embraces without adhering to the innermoſt or tunica albuginea. It will be at once underſtood, that this is a delicate piece of diſſection.

EXPLANATION OF FIG. 2.

The ſecond figure is a further diſſection of the ſame parts.

A, The BLADDER.

B, The UMBILICAL ARTERY.

E, The PENIS.

F, The ABDOMINAL MUSCLES laid down over the haunch, and diveſted of the peritoneum.

G, The TESTICLE.

H, The EPIDIDYMIS, ſtill covered by the peritoneum; it being impoſſible to diſſect it off.

Fig. 1.

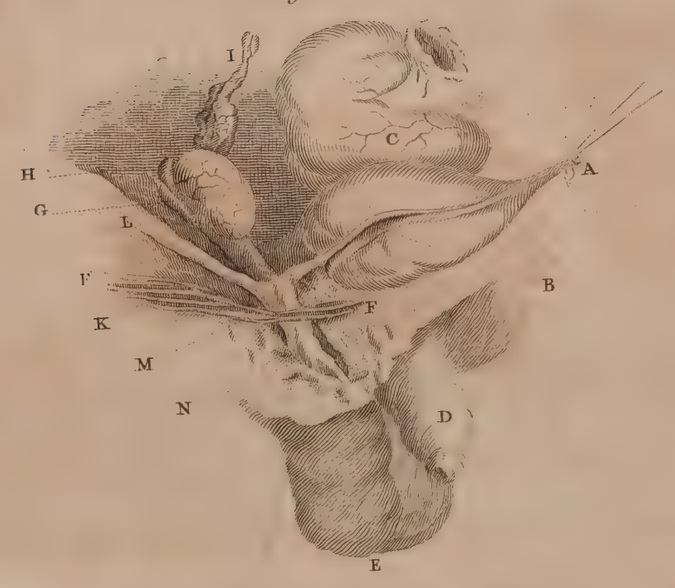


Fig. 2.

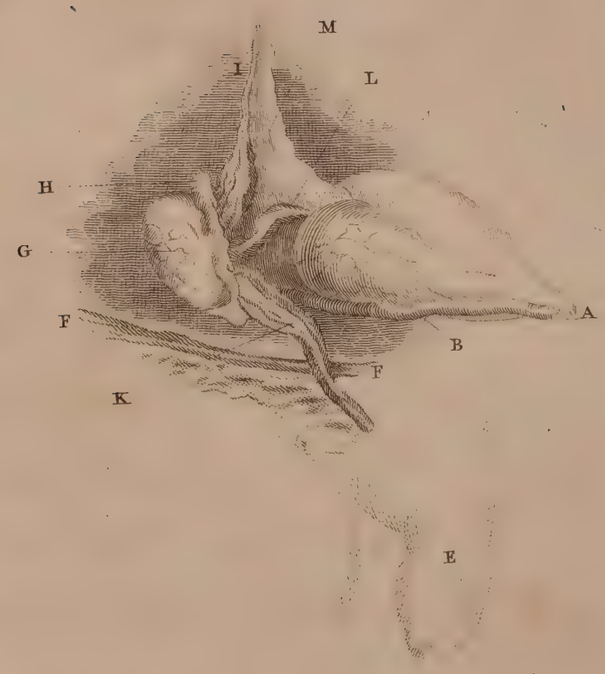


Fig. 3.

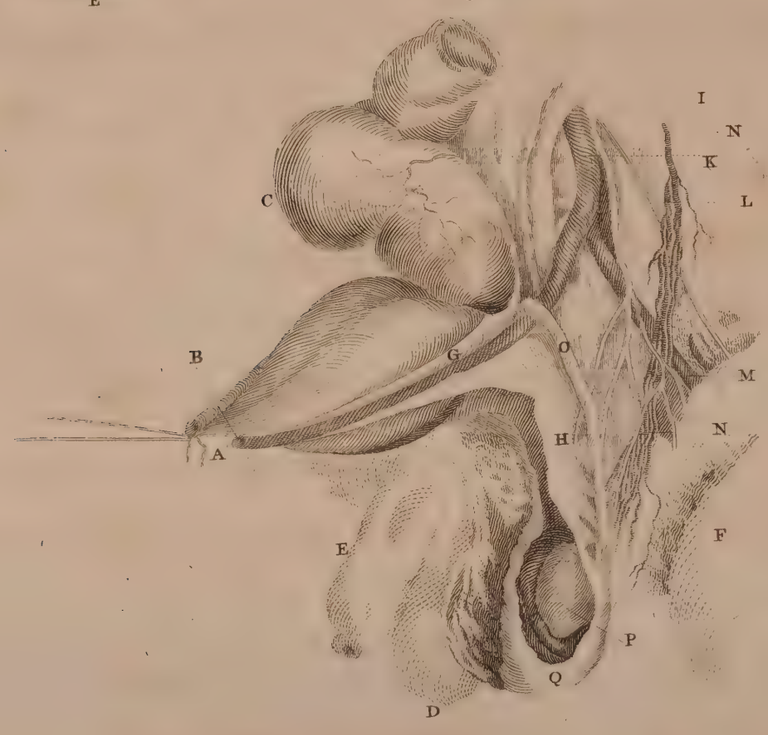
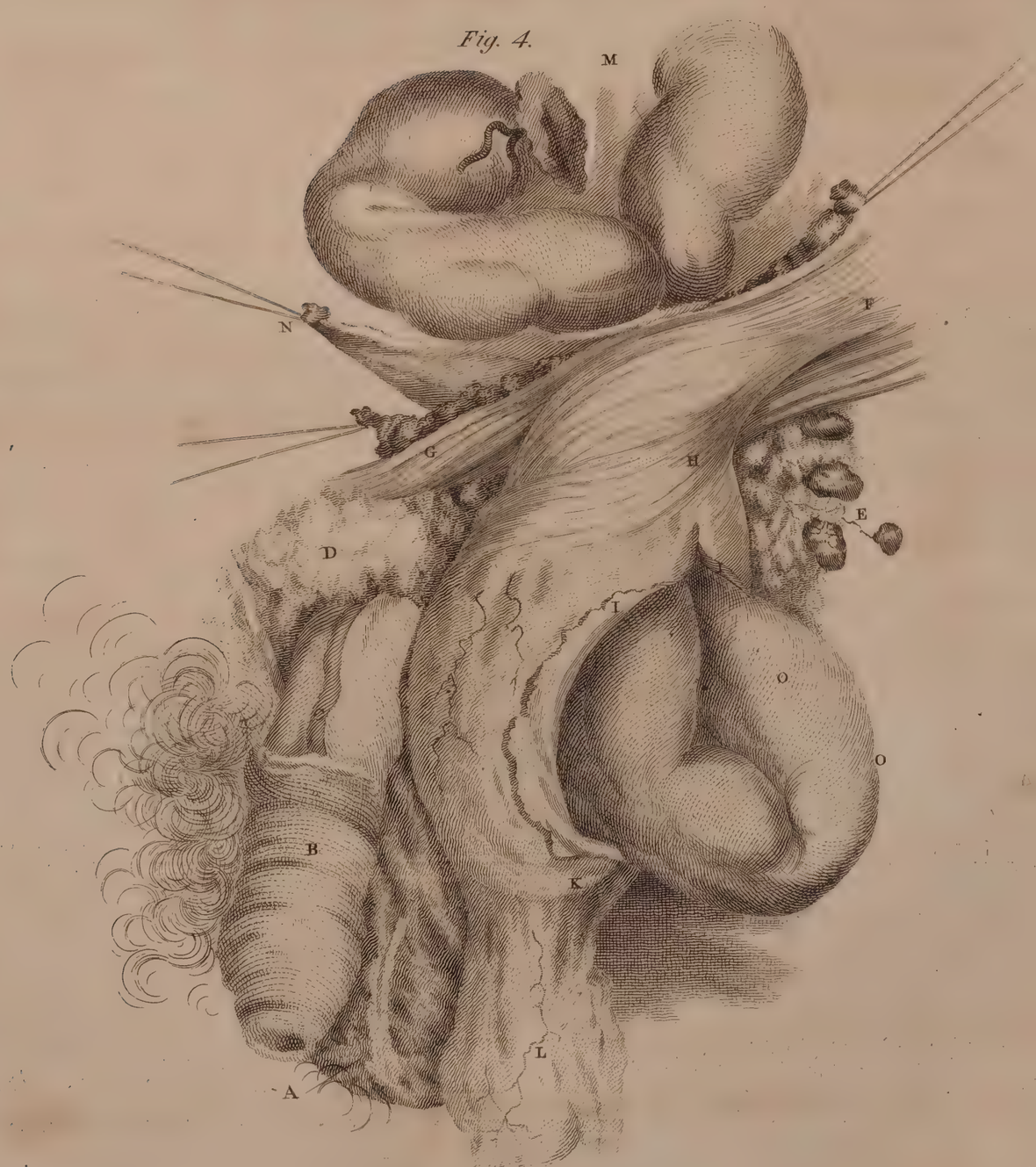


Fig. 4.



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I, The SPERMATIC ARTERIES and VEINS coming down to the teſticle, and diveſted of their peritoneal covering.

K, The GUBERNACULUM TESTIS, with the peritoneum diſſected off in its whole length. This is conſidered as of a ligamentous nature, but has no appearance of a ligament; it is ſeen much crowded with veſſels after a minute injection, and its fibres are apparently muſcular. It is impoſſible to demonſtrate here how the cremaſter muſcle is reflected upon it.

L, The VAS DEFERENS, ſeen going down behind the bladder, and betwixt it and the peritoneum.

M, The PERITONEUM diſſected back from part of the bladder, and from the veſſels of the teſticle, ſhowing how they lie behind that membrane.

EXPLANATION OF FIG 3.

In the third figure we have a view of theſe parts after the full deſcent of the teſticle; but the parts ſtill retain their original features. To lay open this view, the parts were diſſected thus: The peritoneum was raiſed from the inner ſide of the abdominal muſcles; the proceſs of the peritoneum (Q), which ſtretches down through the ring, forming the two coats of the teſticle (like the pericardium upon the heart), was ſtill open; or, in other words, you could inſinuate a probe from the cavity of the abdomen, down betwixt the tunica vaginalis (Q) and the tunica albuginea (P). This proceſs of the peritoneum, then, being gently ſtuffed with cotton, the parts were put into ſpirits to harden. After a few days the diſſection was reſumed. The vaginal coat (Q) was cut, ſhowing the teſticle (P) lying on the back part, as in congenital hernia or hydrocele, and covered by the tunica albuginea; that is, as it lies in fig. 1. G, covered by a ſingle layer of the peritoneum. The peritoneum was then diſſected off the loins, and folded over towards the bladder (G H), in order to ſhow how the ſpermatic veſſels, nerves, and vas deferens, run down behind the peritoneum until they gain the teſticle.

A, The BLADDER pulled aſide.

B, The TWO UMBILICAL OR HYPOGASTRIC ARTERIES cut acroſs.

C, The RECTUM.

D, The SCROTUM.

E, The PENIS.

F, The THIGH.

G H, A portion of the PERITONEUM, which covered the ſpermatic veſſels, held aſide.

I, The URETER going down by the ſide of the rectum.

K, The COMMON ILIAC before giving off the hypogaſtric B.

L, The ANTERIOR CRURAL NERVE; twigs are ſeen going to the groin and ſpermatic chord.

M, The FEMORAL VEIN.

N, The SPERMATIC ARTERIES and VEINS, going down to the teſticle behind the peritoneum.

O, The VAS DEFERENS; where it turns over to deſcend to the veſiculæ ſeminales.

P, The TESTICLE covered only by the tunica albuginea.

Q, The TUNICA VAGINALIS ſlit up, and ſeen communicating with the cavity of the belly.

THE COATS OF THE TESTICLE OF THE ADULT, AND SOME OF ITS DISEASES ILLUSTRATED FROM THE ANATOMY OF THE TESTICLE IN THE FOETUS.

CAUSE OF THE DESCENT OF THE TESTICLE.—It is utterly impoſſible to account for the deſcent of the teſticle by any mechanical action, by the preſſure of the abdominal muſcles, by the periſtaltic motion of the inteſtines, by the generation of wind in them, or by gravitation:—for the fœtus lies in the womb with

the head downwards, the abdominal muſcles are quieſcent, and the probability of occaſional inflation in the inteſtines of the fœtus is very ſmall. Beſides, any general preſſure would, at all events, more probably act upon ſome of the looſer viſcera, and produce rather a hernia than the regular deſcent of the teſticle.

The action of the gubernaculum (K, fig. 1. and 2.) is the more natural explanation. It guides the teſticle into its deſtined lodgment, and probably ſolicits it by a gentle action. Yet this action is unlike the action of other muſcles, being unremitting whilſt the teſticle is within the belly; and when the teſticle is arrived without the groin, a relaxation muſt take place, allowing the teſticle to deſcend into the ſcrotum. It is worthy of remark, that neither the ſpermatic veſſels (I) nor the vas deferens (L, fig. 1. and 2.) appear as if elongated or ſtretched, but retain their peculiar tortuous waving figure. Under the title of GUBERNACULUM TESTIS, the fibres of the future cremaſter muſcle are included; and perhaps this muſcle has the chief action in bringing down the teſticle. The fibres of this muſcle are with difficulty demonſtrated in the human fœtus; but from comparative anatomy, it is found that it is reflected from its origin from the tranſverſalis abdominis upwards, following the gubernaculum. In this ſituation of the parts in the fœtus, the cremaſter muſcle muſt lie behind the peritoneum; but in the adult, as that ſide of the peritoneum, which is contiguous to the pſoas muſcle, becomes in the ſcrotum the outer ſurface of the peritoneum which covers the chord, the cremaſter becomes an outward layer of fibres embracing the chord. The exit of the teſticle through the abdominal ring is certainly facilitated by the gubernaculum as a precurſor. It altogether forms a body of a wedge ſhape or pyramidal form (its baſe being upon the teſticle) which muſt gradually dilate and fill up the abdominal ring. When the teſticle is as yet far up upon the loins, the gubernaculum is ſlender; by its contraction it becomes thicker; and before the teſticle has arrived at the outlet, it ſcarcely forms a larger body than the contracted and thickened gubernaculum which has preceded it.

SITUATION OF THE TESTICLE IN ITS FULL DESCENT.—As the teſticle deſcends, the proceſs of the peritoneum accompanying it changes by inſenſible degrees. Though we ſee in a child upon one ſide the teſticle lying behind the peritoneum like the other viſcera of the abdomen, yet upon the other ſide, if the teſticle have fully deſcended, we ſhall have ſome difficulty (from the additional layers of cellular membrane it has acquired) in diſſecting the veſſels (N, fig. 3.) from the peritoneum (H), to ſhow that the veſſels run down behind the ſac to ſupply the teſticle. Shortly after the deſcent, the prolonged ſac of the peritoneum coaleſces and ſurrounds the ſpermatic chord, now compoſed of the ſpermatic veſſels (I, fig. 2.) the vas deferens (L), and the muſcular fibres (K). Theſe form one meſh;—ſo that no paſſage remains pervious from the cavity of the abdomen down betwixt the tunica vaginalis (Q) and the tunica albuginea (P). Mr. Hunter was of opinion, that in thoſe caſes where the teſticles remain in the belly, the teſticles are diminutive, and more imperfect than thoſe which deſcend into the ſcrotum. But the ſmallneſs of the teſticle may as probably be the conſequence of its remaining in the belly as the cauſe of its delay; and the teſticle may require to deſcend into the ſcrotum to receive its perfect action and tone.

OF CONGENITAL HERNIA.—How widely different the cauſes of the deſcent of the teſticle are from thoſe of a rupture, appears from the rarity of the occurrence of the congenital hernia, or the paſſing down of a portion of the inteſtine alongſt with the teſticle. This is very remarkable, when we conſider that a turn of the inteſtine is not larger than the teſticle to which it lies contiguous, and that the teſticle remains long in the very ring dilating it; yet by the peculiar mechaniſm and interlacing of the fibres of the ring, the inteſtine is not allowed to follow. Indeed, many are of the opinion of the celebrated Wriſberg, that the congenital hernia does not happen but by a previous adheſion of ſome of the inteſtines to the body of the

teſticle, by which it is drawn down alongſt with it. Wriſberg found the ring, in ſeveral inſtances, ſo wide, and the parts ſo lax, as eaſily to allow the deſcent of a portion of the gut or omentum; yet in theſe caſes there was no hernia. Again, he found in other young ſubjects, where the teſticle ſtill remained in the belly, that it had contracted adheſions with the omentum. And, laſtly, he found in a caſe of old congenital hernia (upon opening the belly), that a portion of the omentum ſeemed to be attached to the ring; but, upon further diſſection, he found it continued down through the ring, and adhering to the tunica albuginea of the teſticle. In other caſes, he found the teſticle ſo connected with the inteſtinum cæcum, that in pulling the one either way, the other followed. And, what he conceives to be a convincing proof, he found in one ſide of a ſubject a faſciculus of fibres attached to the teſticle, and incloſed in a duplicature of the peritoneum; while, on the other ſide, though the ring was ſo wide as to allow the finger to ſlip in, there was no hernia. From theſe facts, he conjectures that the congenital hernia is, for the moſt part, formed in conſequence of adheſions betwixt the teſticle and viſcera; and that the inteſtines, or omentum, are, in conſequence, drawn down alongſt with the teſticle. It is a curious circumſtance, if fully proved, that the teſticle not only moſt unaccountably comes down into the ſcrotum, but that its tendency thither is ſo great as to pull down the inteſtine, and elongate the meſentery alſo.

It would be an idle repetition to point out the method of diſſecting and inveſtigating the congenital hernia, ſince the circumſtances of its anatomy, and its character and peculiarities, have been already detailed. The appearance of the more common rupture may perhaps be more opportunely illuſtrated here.

Of inguinal hernia.—Although the abdominal ring be preternaturally wide, if the teſticle ſhall have deſcended naturally, and the peritoneal ſheath be cloſed, hernia congenita is for ever prevented; but if, upon any unuſual exertion, a portion of the inteſtine ſhall be forced through the ring, the old ſheath is not opened, but a new ſac of the peritoneum is forced down; and though it take the ſame courſe with the teſticle, it ſtill, in all its ſtages, remains detached and in a diſtinct proceſs of the prolonged peritoneum.

Of the method of diſſecting hernia.—To explain the appearances of the abdominal ring and ſac, I ſhall follow the method by which I gained my information, truſting that I ſhall always be ſimple and intelligible in the deſcription, while the idea is correctly fixed in my own mind.

In an old caſe of hernia, and where the patient's death has not been occaſioned by the rupture, the ring is wide, the inteſtine looſe in its ſac, and the teſticle lax, hanging far down, and often much waſted. Upon laying open the integuments, the peritoneal ſac of the hernia comes into view; and when the chord and teſticle are extricated in their full length, the preternatural ſac has no marked limits, but ſeems gradually to coaleſce with the chord, being enveloped in looſe cellular membrane and adventitious veſſels. Upon diſſecting up towards the abdomen, we find no ring, but the ſac of the hernia gradually blended with the tendon of the external oblique muſcle (Plate XII. fig. 4.); which, ſtretching over the neck of the ſac, is ſo cloſely mingled with it, that it is only diſtinguiſhable from it by the whiteneſs of its encircling fibres. To demonſtrate further this preternatural connection, we lay open the belly, and examine the ſtate of the viſcera and the portion of gut protruded; we diſſect carefully the peritoneum (N) round the ring from the muſcles, ſhowing how it forms a ſac incloſing the hernia: then we ſhow the ſpermatic chord going down quite on the outſide and behind this ſac, and lay open the vaginal coat of the teſticle, ſhowing that the teſticle lies diſtinct in its appropriated coats: and laſtly, ſhow the hernial ſac diſtinct from the ſpermatic chord or coats of the teſticle.

Appearances of incarcerated hernia.—In a ſtrangulated hernia, where it has been the immediate cauſe of death, though the eſſential circumſtances of the anatomy remain the ſame, the occaſional occurrences are infinitely varied. Upon making an inciſion to lay bare the ſac, it is found tenſe and firm,

crowded with veſſels, and thickened towards the ring; the marks of inflammation are greater: perhaps externally the cauſe of ſtrangulation appears in the inflammation of the ſurrounding membrane, and diſeaſe and ſuppuration of ſome of the lymphatic glands. But in the more recent and ſmaller herniæ, as thoſe more frequent under Poupart's ligament in women, the danger is greater and more preſſing. In ſuch caſes, in the ſtage of the diſſection which we are now conſidering, the inflammation is extenſive; the cellular membrane is caked and hard. In the femoral hernia we have to diſſect and expoſe the faſcia of the thigh; the coat of fibres which ſurround the proper peritoneal ſac of the hernia; and chiefly, to ſhow its relation to the ring, the ſpermatic chord and epigaſtric artery (See the outline, Plate I. fig. 2. and Plate XIV. fig. 1. and 2.).

But to return to the inguinal hernia. Upon opening the belly, the inteſtines are found inflamed and diſtended. If the hernia has been large, the myſentry is elongated by the pulling of the inteſtines, and the viſcera in much diſorder, even the ſtomach having deſcended from its place; ſo that ſometimes in old herniæ the abdomen is left almoſt empty of the floating viſcera. In a caſe where the inteſtines have been reduced either by the operation or taxis, the reduced portions are found lying within the ring adhering; often ſphacelated. Upon laying open the ſac of the hernia (if of old ſtanding), it is found to conſiſt of many layers, ſmooth as the abdominal peritoneum within, including moſt commonly the omentum, or a portion of the ilion in the ſac. If the omentum have fallen down, it will have altered much of its nature, become firm and condenſed, compoſed of hard pellicles of fat irregularly connected by membranes; with frequent ſtrings of adheſion, tortuous dilated veins, and general inflammation. If the ſtrangulation of the gut have advanced far, then it is dark and mortified, with foul ſerum in the ſac: adheſions are frequent betwixt the doublings of the gut, very rare between the gut and ſac. It would appear to me that the irregularity of the functions of the inteſtinal canal, the inflation or congeſtion in the protruded portion of gut, is the more frequent cauſe of ſtrangulation, and of the worſt ſymptoms, in old hernia; and that the inflammation and conſtriction of the neck of the ſac is ſecondary merely. Sure I am, that the inteſtine is ſeldom reduced by the mechanical exertion; but merely the flatus in the inteſtine is forced into the inteſtines within the belly, and then the portion which had deſcended is drawn in by the action of the inteſtinal canal: and, again, it would appear, that frequently in attempting the reduction, the mouth of the ſac is puſhed aſide from the ring, and the reduction prevented.

When the incarcerated portion of the gut gangrenes and ſloughs off, the faſcia, cellular membrane, and glands of the groin, form one confuſed fœtid maſs, and all that can be done is to lay it freely open, and leave it to nature. The upper part of the canal being opened, the load is evacuated by this artificial anus. The patient has ſometimes ſurvived; diſcharging the fæces by the groin. But it is a more curious reſource of nature, by which the fæces reſume their natural courſe in the rectum, although a complete convolution of the gut has been cut off. This is accompliſhed by the two ends of the inteſtines, ſtrictly included in the ring, or under the femoral ligament, forming an adheſion and communication with each other; which is completed by the cloſing of the anus in the groin. This is more frequent in the ſmall femoral hernia of women.

EXPLANATION OF PLATE XII. FIG. 4. SHOWING THE STATE OF THE RING IN HERNIA.

This figure fully illuſtrates the more important points in this piece of morbid anatomy.

A, The SCROTUM of the left ſide laid open.

B, The PENIS.

C, VENA IPSIUS PENIS.

D, Maſs of fat upon the pubis, which reſtrains the erection of the penis.

E, INGUINAL GLANDS and FAT.

F, TENDON of the EXTERNAL OBLIQUE muſcle.

G, The inſertion of the two pillars of the ring into the os pubis.

H, Marks the fibres of the TENDON running in diverging circles, as if carried down by the protruſion of the ſac.

I, The SAC laid open to ſhow the gut.

K, The bottom of the ſac.

L, The TESTICLE conſiderably diminiſhed.

M, The GUT ſeen within the belly.

N, The PERITONEUM held out by a thread, having been diſſected from the abdominal muſcles.

O, The PORTION of the GUT included in the hernia.

N. B. The relative ſituation of the parts in the femoral hernia will be fully illuſtrated in treating of the veſſels of the thigh.

OF HYDROCELE.—As in the laſt ſpecies of hernia the inteſtines take a new rout, and are preceded by a diſtinct ſac of the peritoneum; ſo in hydrocele, the tunica vaginalis teſtis being diſtended with fluid, the original ſheath (Q, fig. 3.) is not again opened, but that part which envelopes the chord (now degenerated into looſe irregular cellular membrane) remains entire, while the diſtended ſac ſwells on all ſides, but chiefly upwards, and before the ſpermatic veſſels conically. So that, upon laying open the ſac in the operation for the radical cure, the teſticle is ſeen covered only by its proper tunica albuginea, unleſs when, by frequent tapping, a partial inflammation has been communicated to the teſticle; in which caſe, it very commonly adheres to the fore-part of the tunica vaginalis which had been punctured with the trocar. To demonſtrate the anatomy of an advanced hydrocele, we inject the ſpermatic veſſels, follow the chord down behind the ſac formed by the dilated vaginal coat, fill the ſac, by a ſmall puncture, with ſpirits, and harden the whole in ſpirits for a few days;—then opening the vaginal coat, to ſhow the ſituation of the teſticle, the preparation is preſerved in ſpirits.

The diſeaſes of the ſpermatic chord ſhow us how completely it is changed in its nature from that of the peritoneum; for its cellular ſtructure ſometimes becomes the ſeat of dropſical ſwelling, forming a ſpecies of hydrocele:—ſometimes it appears like a collection of hydatids, yet neither communicating with the vaginal coat of the teſticle nor with the cavity of the abdomen:—ſometimes the hydrocele conſiſts of only one or two veſicles; and when the lower portion of the chord is preſſed, the ſwelling ſubſides, and retires to the cells in the chord within the abdomen. Knowing how peculiarly liable ſuch a congeries of veins as that which forms the ſpermatic chord is to diſeaſe, we cannot wonder to find the tortuous veins of the teſticle ſo ſubject to varicoſe enlargement and all its conſequences.

OF THE INVESTIGATION OF DISEASE IN THE PELVIS, AND OF THE MORBID STATE OF THE PARTS.

In their diſeaſed ſtate, the parts in the pelvis ſhould not be cut out haſtily, or before attention be paid to ſuch points as can alone be illuſtrated by an examination of the parts in ſitu. After the great operations, the ſpreading of inflammation to the bowels, the ſtage to which the inflammation has proceeded, the quantity of matter, and the courſe of ſinuſes near the wound, ſhould be obſerved:—then the parts being carefully waſhed, and the veſſels perhaps injected (if the ſtate of the ſubject will allow it, and if they be of conſequence in the diſſection, as after lithotomy), a freer inveſtigation may be allowed.

For example, in a caſe of lithotomy, we have to obſerve the ſtate of the inteſtines. If the patient has died ſoon after the operation, the degree of inflammation amongſt the inteſtines, and their diſtention; if the patient has lingered and died debilitated, the inflammation will have ſubſided, and there will be adheſions amongſt the inteſtines, inflation, and in all likelihood ſcybulæ; the lower portion of the colon, at leaſt will be diſtorted and inflated, forming preternatural adheſions. We have to obſerve the direction of the inciſion; the ſtate of the wound; the ſinuſes, that too often ſtretch up from it by the ſide of the rectum, and the effects of which will generally be ſeen upon the peritoneum, by folding back the rectum from the ſacrum.

In diſſection, after puncturing the bladder, or after a tedious caſe perhaps of retention of urine where the catheter has been uſed, the inſtruments ſhould be allowed to remain: Then the bladder being opened from above, we can obſerve their true place, ſee them projecting into its cavity, judge of their effects, and of the inflammation in conſequence, and of their preſſure and effects on the neighbouring parts or oppoſite coats of the bladder. In taking out the parts, the penis ſhould be firſt ſeparated from the pubes (which, by the by, may be done without leaving any apparent deficiency, by leaving the ſkin and glans), the crura cut from the bone, and the whole forced down under the arch of the os pubis: Then proceeding to the inſide, cut all freely out, by carrying the knife cloſe to the bones of the pelvis; by which all the parts are retained for further inveſtigation in their natural connections.

How much more important does it make a preparation, to ſee the kidney diſeaſed, ſtones impacted in its ſubſtance, or abſceſſes excavating it, the dilated tortuous ureters, the contracted and thickened bladder with the ſtone in its cavity, or the diſeaſed proſtate gland, and conſtricted urethra, all connected and illuſtrating each other,—than if each of theſe were detached and in ſeparate glaſſes? If ſtudents would learn to value a muſeum, not by the numbers of the glaſſes and magnitude of the collection, but by the elegance, cleanlineſs, and uſeful inferences to be drawn from preparations of morbid parts, or the important points in anatomy which are illuſtrated by the others, teachers would become aſhamed of their opportunities thrown away, and merit would attach to thoſe who had made the beſt uſe of their ſituation.

Of the bladder.—Although in the great dilatation of the bladder from retention of urine, there is, in general, no apparent change in the coats; yet, in ſome inſtances, the inner membrane has been found loaded and black with extravaſated blood. Where rupture has taken place, the gangrene is of ſmall extent, and circumſcribed. In caſes of ſtone, cancer, and tumors, in the bladder, it is generally thickened (probably by continued irritation), and the inner membrane, if not evidently inflamed, is covered with an adheſive ſlimy matter. In ſuch as die violent deaths, and in ſome fevers, the bladder is ſaid to be found in a ſtate of very ſtrong contraction.

In obſtruction of urine, the bladder ſuffers aſtoniſhing dilatation; it does not burſt, but becomes gangrenous; a ſmall ſpot in its fundus ſhall mortify and give way, and the urine eſcape amongſt the viſcera. When the bladder has ſuffered long diſtention, although the urethra be not obſtructed, the bladder ſhall have loſt its tone, the urine ſhall drop from the penis, but the patient is in the ſame danger of gangrene if the waters are not drawn off.

The moſt common effect of diſeaſe, as of a ſtone, ulcer, or fungous excreſcence, in the bladder, is the thickening of the coats, ſometimes even to half an inch in thickneſs. But this, if we examine narrowly, cannot be miſtaken for an increaſe of muſcular force, in order to overcome the difficulty of expelling the urine. The bladder, in this ſtate, becomes thickened, but at the ſame time inert. It gives great reſiſtance to diſtention, but its contraction is alſo limited: The urine is expelled frequently, and in ſmall quantity, but never completely evacuated.

The inner ſurface of the bladder is, in ſome caſes, diſeaſed with fungous or polypous excreſcences; ſometimes there are ſmall irregular tubercles upon its whole inſide; and not uncommonly ſuch tumors

acquire a cartilaginous hardneſs, which, during the life of the patient, is with difficulty diſtinguiſhed from a ſtone. Even in ſome rare caſes, ſtones have, I believe, been formed in thoſe tumors; though a more frequent, but ſtill a very rare occurrence, is, that the ſtone, lying encyſted betwixt ſome of the ſtronger faſciculi of fibres, they contract round the ſtone while it has fallen into the interſtice, and hold it immoveable. There is an explanation of thoſe calculi being formed in the ulcerated tumors of the internal coat of the bladder. I believe that calculous matter will adhere to a diſeaſed ſurface, though it will not concrete upon the ſmooth and ſecreting ſurface of the internal coat of the bladder. Thus, after lithotomy, I have found the lips of the inciſion into the bladder prominent, and covered with a calculous cruſt.

THE PROSTATE GLAND may be found ſwelled or obſtructed by caſual inflammation, or being enlarged, abſceſſes frequently pervade it. But theſe, it is remarked, do not ſo often attack the ſubſtance of the gland, as the cellular membrane ſurrounding or connecting its lobes. The gland itſelf does not eaſily ſuppurate.

In enlargements of this gland the conſtricting fibres upon the mouth of the bladder have a ſtrange effect in moulding the gland, as it gradually enlarges ſo as to protrude it backwards into the cavity of the bladder; which ſometimes increaſes ſo much (as all tumors do having once got a direction), that it forms a pendulous valvular excreſcence from the neck of the bladder, preventing the diſcharge of urine.

The enlargement of this gland may ſometimes not improperly be called a varicoſe enlargement; becauſe the enlargement is not ſo much of its ſubſtance as of the ſurrounding parts and circle of veins, which are in ſituation and diſeaſes ſomewhat analogous to the hæmorrhoidal veſſels. I have ſeen in the neck of the female bladder as great an enlargement as in the male: And in many caſes, in diſſecting diſeaſed parts to give a clear and diſtinct view, the tumor gradually vaniſhes; and before we are aware, no mark of diſeaſe remains. But of this there is no danger in the moſt frequent kind of diſeaſe, the moſt incurable and diſtreſſing malady, the ſchirrous enlargement, in old men. Too frequently, in the laſt ſtage of life, diſeaſe, and the debility of old age, falls upon the urinary paſſages, cauſing an irritability in the bladder and ſwelling of the proſtate gland, and terminating life with excruciating agony.

Even when no mark of diſeaſe is apparent, yet upon cutting into the gland, ſmall chocolate-coloured ſtones like ſeeds are found filling up its ducts, or in little ſacs. I have ſeen this gland ſtuffed with them like the gizzard of a fowl.

THE VESICULÆ SEMINALES ſeem to be ſeldom the ſeat of diſeaſe, though, from their ſituation behind the proſtate gland, they muſt frequently be involved in the diſeaſed ſtate of the rectum and bladder. Something of their affections has been already mentioned.

Following the courſe of the urethra, we may obſerve, that the GLANDULÆ ROTUNDÆ, or COUPER'S GLANDS, are frequently the ſeat or origin of extenſive runnings of matter into the urethra, and of fiſtulæ in the perineum; at leaſt ſuch have been the obſervations of ſome, while it has been as abſolutely denied by others. It has been obſerved, that ſtrictures are more general about the bulbous part. They are white, hard, partial only, or of ſmall extent; and in gonorrhœa, it ſeems confirmed by thoſe who have had the beſt opportunity of examining the urethra in diſeaſe, that there is no ulceration; the LACUNÆ are found filled with matter, and the inflammation chiefly towards the extremity of the urethra. The LACUNÆ of the urethra bear no relation to the ſmallneſs of their glands; for they are ſometimes ſo large as to receive the point of the catheter, and prevent its introduction into the bladder: and this is the more apt to happen, ſince the mouths are directed forwards, and act like a valve againſt any thing going contrary to the ſtream of urine. The effect of theſe lacunæ, as I ſhould underſtand it, is admirable: They are ducts to the glands; but they are reſervoirs alſo, retaining their little ſtores to lubricate the canal

during the paſſage of the urine. The increaſed diſcharge from theſe muſt frequently baffle the uſe of injections, as their form defends them, in a great meaſure, from the contact of the fluid.

To examine that portion of the urethra which is embraced by the proſtate gland, it muſt be ſlit open upon its upper part. The verumontanum is upon the under ſide of the urethra; a little eminence marks it, ſtretching forwards into the canal with an acute ridge. On the moſt prominent part of this caruncle the veſiculæ ſeminales open in two diſtinct orifices; but a probe or briſtle is with difficulty introduced, owing to the ſoftneſs of their membrane and the collapſing of their mouths. All around this the numerous orifices of the proſtate gland open into the urethra. The ſecretion of the proſtate gland is frequently vitiated, and alſo that peculiar to the veſiculæ ſeminales; the ducts muſt be peculiarly affected during the diſcharge of ſemen. Whether the verumontanum ſuffers a kind of erection or relaxation, it will be difficult to ſay; but it is evident, that tumors or ſtricture muſt eſſentially affect that diſcharge, and occaſion juſt alarm to the patient. Of this ſee above, page 81.

Of the kidney.—The varieties in the form and diſtribution of the emulgent arteries and veins, and in the ureters and pelvis, and whole of the gland, are ſo frequent, that they can ſcarcely be conſidered as curioſities.

It is probable that coagulated blood, or partly concreted mucus, having been forced out from the ducts, may have given riſe to the idea of worms being ſometimes found in the kidney. There is no doubt, however, that ſuch concreted mucus, or blood, frequently form the nucleus of calculi in this gland, for the natural mucous ſecretion, which continually exudes from the urinary paſſages, allowing no depoſition from the urine to take hold upon them, prevents the formation of calculi. Urinary calculi may be the ſymptom of a more univerſal diſeaſe; or may be only caſually produced in the bladder by an accidental nucleus. The ſtrange accidents by which foreign matters are made to form the centre of calculi, are innumerable and almoſt unaccountable; pieces of leaden probes, bougies, catheters, balls, needles. This local and accidental form of the diſeaſe is certainly the moſt favourable.

Suppuration following inflammation of the kidney, will form at one time an immenſe depoſit of matter, converting its ſubſtance into a ſac of pus; at another, only partial abſceſſes. Such collections have ſometimes been evacuated by the ureters, cauſing in their courſe, before they got to the bladder, dangerous retention of urine; or it may happen, that, by communicating with the colon, the matter may be evacuated by ſtool. It may ſpread amongſt the ſurrounding cellular ſubſtance, or it may even point outwardly to the loins. Such diſeaſed action in the kidney has gone ſo far, that its ſeat has been only marked by a more condenſed indurated cellular ſubſtance.

In chronic diſeaſe of this gland, the appearance, on diſſection, is very different. It acquires an enormous ſize; or it becomes ſoft; or degenerates into an aſſemblage of hydatids; or perhaps a ſteatomatous maſs.

We may be at once ſenſible, why, upon inſpiration and expiration, or in going to ſtool, or in efforts to make urine, the pain of inflammation in the kidney becomes more violent, when we obſerve its ſituation upon the muſcles of the loins and upon the diaphragm, and how it muſt be affected by the play of the latter muſcle. We may underſtand likewiſe, how in inflammation or enlargement of the kidney, a ſtiffneſs and numbneſs is produced in conſequence of the contiguity of the anterior twigs of the lumbar nerves; which, running downwards, play upon the groin and fore-part of the thigh. In retention of urine from the obſtruction of the ureters by ſtones, hydatids, or clots of blood, they are ſometimes ſo much dilated as to reſemble a ſmall gut; and they become, at the ſame time, tortuous, or are irregularly diſtended; and in their partial dilatations, their internal coat is ſtretched acroſs like a valve. Their coats too, in all ſuch caſes, become thickened. Where there is obſtinate reſiſtance, even the pelvis and ducts of the kidney become enlarged like a ſecond bladder.

Of the rectum.—The rectum being a very glandular part, largely ſupplied with veins, and expoſed to a variety of exciting cauſes, is very ſubject to diſeaſe; and peculiarly to ſchirrous thickening and contractions of its cavity. When ſuch derangement proceeds to cancerous ulceration, it makes an ugly maſs of diſſection. In the laſt ſtage of ſuch a caſe, it will be found that the bladder is drawn into diſeaſe; that the ſurrounding cellular ſubſtance is hard and ſchirrous, ſometimes reſembling tallow; and that purulent abſceſſes run through it, perhaps forming communications betwixt the gut and bladder; the coats of the bladder alſo are thick and hardened, ſometimes cartilaginous.

It ſhould have been obſerved, in ſpeaking of the Section of the Pelvis, that in the adult the rectum is dilated into a great bag or receptacle immediately above its ſtrong ſphincter fibres; and we ought to recollect how neceſſary it may be to examine the ſtate of this part in all operations in the perineum.

In woman, the action of the tranſverſalis perinei, ſphincter ani, and levator ani muſcles, differ in no reſpect from thoſe of man. The vagina has its peculiar ſphincter; but more internally, it is embraced by the levator ani. Beſides theſe muſcles, the vagina is influenced by the inflation of blood, like the penis in the male; for it is of a ſpongy nature, and interwoven with numerous blood-veſſels; and a cavernous vaſcular plexus ſurrounds the urethra, and is ſpread out upon the ſides of the vagina. The ſtate of all theſe parts is influenced by the ſame excitement with the cavernous bodies of the penis. The diſorder and relaxation of theſe muſcular faſciculi are followed by the ſame conſequences as in man; and from the interlacements of the conſtricting muſcles of the bladder, vagina, and rectum, and the univerſal connection of the levator ani, the ſame ſympathies and deranged ſenſations take place in diſeaſe.

Women, it is allowed, are more ſubject to hæmorrhoids than men; more eſpecially ſuch as have born children. This probably originates from a greater irregularity and leſs ſenſibility in the inteſtinal canal; from the preſſure upon the hæmorrhoidal veins in pregnancy; and in ſome meaſure, perhaps, from the wideneſs of the bones, and the greater ſtrength of muſcles requiſite to guard the perineum, whoſe occaſional derangement will be more extenſively felt. As the action of the muſcular fibres of the rectum in producing this diſeaſe has been already mentioned, little remains but to mark its varieties. Though in children piles may be occaſionally produced, yet in that caſe they quickly retreat, or there is a ſlight inflammation, in conſequence of which they become hard and painful, but are never permanent. But in elderly people, with habitual coſtiveneſs and its attendant frequent teneſmus and gripes, the piles gradually increaſe, and the veins, having a tendency to become turgid and varicoſe, theſe tumors become habitual; conſiſting of enlarged veins covered with the thin ſkin of the margin of the anus; ſometimes they are ſituated within the orifice and hid. In a more advanced ſtage, or what perhaps may be conſidered as a different ſpecies of the diſeaſe, theſe veins open upon the ſurface of the tumors, and, bleeding, become periodical in their diſcharge, connected with plethora of the venous ſyſtem of the abdominal viſcera, or the flow of the menſes, and no longer a local diſeaſe.

It may be uſeful to recollect, of how much conſequence continued preſſure is in many diſeaſes of the rectum; for we find, that in many caſes tents introduced have made wonderful cures of what was underſtood to be ſchirrous thickening of the coats; and where, by the narrowing of the paſſage, the fæces were almoſt entirely obſtructed. In women of ſuſpicious character, we muſt recollect that the venereal diſeaſe is more apt to be communicated to the anus, and give riſe to ſymptoms which may be miſtaken for worſe diſeaſes. The margin of the anus is ſubject to ulceration, to cancerous open ſores, with luxuriant protruding edges. Although theſe tumors be apparently hopeleſs from their outward appearance; yet in examining

by the anus, we find the diſeaſe of the gut reaching but a little way inwards, and ſafely within reach of the knife. With ſuch a tumor, I lately ſaw almoſt the whole circle of the ſphincter cut away. There is danger of much bleeding, in the firſt place, from the pudic arteries lying by the ſide of the iſchium; in the next place, from the hæmorrhoidal arteries on the extremity of the gut. The gut is immediately retracted, and theſe veſſels are with difficulty taken up. I was obliged, in the caſe which I have juſt mentioned, to pull the rectum ſtrongly out with the polypus forceps, before the tenaculum could be ſtruck into the mouths of the arteries. One inadvertently conceives, that, by cutting the ſphincter, the patient muſt loſe the power of retaining the fæces; but it is not ſo; for while the belly is natural, the contents of the inteſtines are urged downwards by ſuch ſucceſſive motions, that the ſtools are regular and eaſy.

It was already obſerved, how the neck of the bladder in the female ſometimes becomes diſeaſed, reſembling that ſo frequent in the male. In a caſe of this kind, the patient being examined by the vagina, it was ignorantly ſuppoſed to be a ſchirrus of the vagina, from the extreme pain upon examination, and the feeling of a hard irregular ſurface, which was occaſioned by ſcybalæ in the rectum. This appears ſo unworthy of notice, that it ſhould not have been mentioned, had not the woman been frequently examined, and at ſome diſtance of time, and by gentlemen who ſhould not have been eaſily deceived. The ſchirrous ſtate of the vagina, however, is not a rare occurrence; but is more generally connected with the ſchirrous ſtate of the womb, and probably produced by the diſeaſe of the latter encroaching upon it.

Cancer of theſe parts forms a terrible diſeaſe: ſometimes opening communications with the bladder; ſometimes with the rectum, with irregular ragged ulceration, and attended with excruciating lancinating pains.

The effects of the venereal diſeaſe muſt frequently preſent themſelves in the diſſection of theſe parts. Inflammation producing adheſions, often callous contractions, and narrowing of the vagina from the cicatrix of old ulcers, recent ulceration and excoriations.

The relaxation of the vagina, attended with a degree of laxity in the neighbouring parts, and perhaps wideneſs of the bones of the pelvis, allows the UTERUS to glide down and hang upon its ligaments, ſo as to prolong them gradually, till the vagina being inverted, the os tincæ appears externally, forming PROLAPSUS UTERI, or rather PROCIDENTIA UTERI, which is the greater degree. Sometimes, by the ſame relaxation of the parts, the uterus falls backwards by the weight of the fundus, and the neck lies obliquely acroſs the pelvis, and perhaps preſſes upon the neck of the bladder. This, however, is properly a diſeaſe of the firſt months of pregnancy; which, if allowed to go on unreduced, becomes a moſt alarming cauſe of retention of urine. The cure of this diſeaſe by peſſaries is a delicate matter; for by the continued preſſure upon the vagina, a hollow is gradually made; by the continued irritation pus is gradually formed, ulceration follows, and the conſequence is a fiſtulous ſore perforating the vagina, the ſuppuration ſpreading amongſt the cellular membrane *.

The neck of the uterus is moſt frequently the ſeat of diſeaſe; the veins about it become varicoſe and enlarged, like the hæmorrhoids of the rectum. When it is ſlit up, irregularities, or the rudiments of ſarcomatous tumours appear; which ſometimes enlarging, and becoming pendulous, fill the whole vagina, and appear at the external part. But theſe polypous tumors are not peculiar to this part, but common to the whole uterus. Theſe tumors may grow from any part of the uterus or vagina, and are of very different degrees of firmneſs. Polypi, by the perpetual excitement of the womb, occaſion profuſe menſtruation; and often there is ſuch bleeding from the tumor, as to weaken and totally deſtroy the conſtitution of the patient. They not unfrequently have a cancerous diſpoſition. When theſe tumors appear

* The ſlight mention of the ſtructure and diſeaſes of parts, requiring variety of illuſtration and minute detail, is irkſome to an inquiſitive mind; ſuch, I am afraid, the preſent mention of theſe affections of the uterus will appear; but this is no place to enter fully into this ſubject.

externally, they may be miſtaken for the prolapſus of the womb: for this latter is not always a regular tumor, with the projecting os tincæ diſtinctly to be recognized; but, on the contrary, it is frequently very irregular and diſtorted, the orifice of the womb turned aſide, the vagina firmly adhering. Even in diſſection, ſometimes it is impoſſible to unravel the adheſions; and it is only known to be a prolapſus of the womb from the change in the viſcera, and the ſinking downwards of the fundus uteri betwixt the rectum and bladder. During life, it is known by the ſtilicidium, or by the periodical diſcharge from the orifice of the womb. The prolapſus uteri is often preceded and occaſioned by a diſeaſed ſtate of the uterus itſelf; or it is likely that a dormant diſeaſe of this viſcus may be excited by the eſcape from preſſure, by the expoſure of a ſecreting ſurface to air, and the attrition to which the parts are liable; and a terrible ulcerated fungous maſs is formed, taking away all ſemblance of the original form of the parts.

As of ſome conſequence in the examination of theſe diſeaſes in the living body, it may be obſerved, that when examining either in ano or within the vagina, the tumors or diſeaſed parts may not come within the touch without changing the poſture of the patient, placing her in an erect poſture, or in that of going to ſtool, and cauſing her to make an effort; by theſe means only, the uterus, or tumors, or polypi, can be brought downwards within the reach.

Of all the parts of the female pelvis, the ovaria are the moſt frequently diſeaſed. But in reference to practice, the knowledge of them is unimportant; except in caſes of dropſy, which are extremely frequent.

The changes of the ovaria can ſcarcely be conſidered as diſeaſe: in old age they ſhrink and become diminiſhed in ſize; ſometimes they become ſolid; they become more diſtinctly veſicular and enlarged, and full of a yellow turbid fluid; they become a congeries of ſmall hydatids:—Theſe diſeaſes advancing, they become ſchirrous, enlarged and firm, containing a ſteatomatous cheeſy matter, or diſtinct ſacs of fluid. In conſequence of diſeaſe following impregnation (an imperfect impregnation is very improbable), we find fatty and ſtrangely condenſed matter; or, in ſome rare inſtances, hair matted and condenſed; and even teeth growing and fixed as in a ſocket, and with a completely formed enamel, as if the pulp and membranes of the teeth had been engrafted, and taken a communication of veſſels from the ovum, then grown to full maturity. In the dropſy of the ovaria, they ſometimes ſwell to immenſe ſize, filling the whole belly. The encyſted dropſy of the ovarium, when it has proceeded thus far, can only be diſtinguiſhed from the hiſtory of the caſe. The ſwelling is in the beginning diſtinct, inſulated, and moveable, and ſituated to one ſide, anſwering to the ſeat of the ovarium. It gradually dilates till it comes in contact with the peritoneum of the abdominal muſcles, adheres to it, ſtretches up to the diaphragm, forms adheſions with its lower ſurface, and throws back and compreſſes the inteſtines without adhering to them. From the more glutinous nature of the fluids, in the incyſted dropſy of the ovarium, it will generally require a larger trochar than the aſcites abdominalis.

To give a full and comprehenſive view of the diſeaſes incident to the female pelvis would lead to a very long diſcuſſion. It would comprehend appearances infinitely varied, eſpecially in the impregnated ſtate. The diſeaſes of the uterus, placenta, and chord; of the ovum in all its ſtages, and particularly the abortion of the firſt months, with their multiplicity of deranged appearances, are difficult to be underſtood; and the explanation of them requires a complete knowledge of a very delicate and minute piece of anatomy, together with much practical dexterity. It is indeed a ſubject ſo extenſive, that it cannot be fully treated of on the preſent occaſion.

In treating of the morbid anatomy, I have endeavoured to avoid the appearance of attention to minutiæ where nothing is underſtood, or where I could give no information; ſenſible that ſuch an attempt fills the eye only, and becomes a mere catalogue of diſeaſes. But I have attempted to place this part of my ſubject upon the wider baſis of the mechanical action of the parts or general conſequences, extenſively applicable, as depending upon the laws of the economy.

DIRECTIONS FOR THE BINDER.

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A

SYSTEM

OF

DISSECTIONS.

PART IV.

CONTAINING

DISSECTION OF THE FASCIA AND SUPERFICIAL PARTS ON THE FORE PART OF THE THIGH;

DISEASES OF THE CUTANEOUS VEINS, LYMPHATICS, AND FASCIA;

OF THE LIGAMENT OF THE THIGH AND FEMORAL ARTERY IN THE GROIN;

TUMORS IN THE GROIN;

FURTHER DISSECTION OF THE ARTERIES AND NERVES OF THE THIGH;

ACCIDENTS AND DISEASES OF THE ARTERIES OF THE THIGH;

OF THE POPLITEAL ANEURISM;

OF THE CHANGES WHICH TAKE PLACE IN THE CAPACITY AND ACTION OF ARTERIES;

AND OF THE CIRCUMSTANCES WHICH INFLUENCE THOSE CHANGES.

WITH PLATES.

SECOND EDITION.

BY CHARLES BELL, SURGEON.

EDINBURGH:

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1800.

SYSTEM

OF

DISSECTIONS.

DISSECTIONS OF THE THIGH.

Remarks introductory to the Diſſection of the Extremities; the Effects of the Muſcles and Faſcia upon the Veſſels; and the Peculiarities in the Diſtribution of the Veins and Arteries.

IN the diſſection of the thigh, the method of inveſtigation, as well as the object of it, is eſſentially different from that which is followed in the diſſections of the belly and thorax. We find the limbs made up of a ſolid muſcular fleſh, which ſurrounds the bones, gives ſymmetry and action to the limbs, and poiſes the trunk upon them: and, beſides the integuments common to every part of the body, we find them covered with ſtrong faſcia or the aponeurotic extenſion of prolonged tendons; which not only ſupports and braces the muſcles in their action, but gives the limbs a defenſive ſtrength, by forming them into a firm concentrated pillar.

The fibres of the faſcia, too, mingling with the common cellular membrane, dive amongſt the deeper muſcles, and divide and claſs them into faſciculi, having ſimilar powers and ſimultaneous action. We find the arteries branching amongſt the muſcles, and expoſed, we might at firſt ſuppoſe, to be interrupted in their actions amongſt thoſe active and contractile parts; but theſe arteries have energy and force to overcome or reſiſt the contraction of the muſcles of the limbs. The more languid flow of blood in the veins is indeed left expoſed to caſual interruption by compreſſion of the muſcles; but this preſſure upon the veins is counteracted, or its bad effects avoided, by their peculiar diſtribution. In the legs and arms, and in the neck and all fleſhy parts, there are two ſets of veins: the venæ comites, accompanying the arteries through their whole courſe amongſt the muſcles; and the cutaneous veins, which, though like the others they receive the returning blood from the arteries, take a different courſe to the heart, emerge from the oppreſſion of the muſcles, and return their blood by a ſuperficial diſtribution to the heart. We obſerve no ſuch variety of diſtribution in the cheſt or belly—no valves to counteract the retrograde impulſe of the blood; becauſe in theſe cavities there is no occaſional and partial action of parts by which the return of the blood can be retarded, the preſſure being uniform through the whole cavity—and becauſe, from this uniform preſſure, no diſtribution of the veins could free them.

When any preſſure is made upon the upper part of the thigh, if the pregnant uterus, for example, ſhould preſs upon the veſſels of the pelvis, or a ſchirrous tumor ſhould ariſe from the glands of the groin

ſurrounding the crural veſſels, the veins are the firſt to ſuffer; the ſupply of blood is not diminiſhed, but the free return of the blood is retarded, cauſing œdema: and in the caſe of an adventitious tumor, though both arteries and veins paſs through it, the arteries, by the ſtrength of their pulſation, remain free, and poſſeſſed of full room for action, however large the tumor; while the veins, being more paſſive, having no action, are encroached upon by the tumor, and compreſſed, and the blood made to ſtagnate in their dilated extremities.

We learn from this the importance of making the preſſure uniform over all the lower part of the limb, when we apply bandages or compreſs an artery. Were it poſſible ſo uniformly to compreſs a limb, from the toes to the top of the thigh, as to leave no part unincluded or unſupported (unleſs in inflammation of the parts), almoſt any degree of compreſſion might be uſed; for in that caſe the blood would flow uniformly over the whole limb; and though ſtifled in a degree, no part would be overloaded with blood.

Further peculiarities in the anatomy of the extremities will naturally come to be noticed in the courſe of the hiſtory of each diſſection.

FIRST DISSECTION OF THE THIGH.

Of the Faſcia of the Thigh, the Inguinal Glands and Superficial Veſſels, the Lymphatics and Cutaneous Nerves.

In acquiring a knowledge of the economy of the body, of the peculiarities in the diſtribution of the veſſels of the extremities, of the uſe and effect of the faſcia, and of the characteriſtic difference betwixt the limbs and the cavities of the trunk and head, this forms an important diſſection. With a view to ſurgery, it is no leſs important; ſince a knowledge of the points of anatomy, which it includes, is extenſively applicable to practice. It is almoſt impoſſible, by deſcription alone, to give ſuch an idea of the appearance of the veſſels and membranes, as to enable any one readily to diſtinguiſh them in the diſſection; yet much aſſiſtance may be given, and the character of the parts may be ſo pointed out, that, when once ſeen, the recollection will not be quickly effaced.

PRECAUTIONS NECESSARY IN CONDUCTING THE DISSECTION.

In laying open the integuments of the FORE PART of the THIGH, we ſhould not cut too deep, nor look for the ſmooth and ſtrong faſcia, which, from deſcription, we may naturally have been led to expect; for upon the fore part, and above the tract of the important veſſels, the faſcia is of a looſe and cellular texture; and the gradual change which it undergoes is to be obſerved only by tracing it from its ſtronger expanſion on the outer part of the thigh.

The true ſkin only ſhould be diſſected back, leaving much of the ſubjacent cellular membrane. The parts which then come into view may here, as a general inſtance, be marked.

The LYMPHATIC VESSELS are immediately under the true ſkin. They are more ſuperficial than the veins and nerves. They run in ſtraight lines, are only partially ſeen, or are frequently abruptly broken off by the intervening pellicles of fat. They are very large and varicoſe in appearance, when diſtended,

in the courſe of the ſaphena vein; more numerous upon the middle part of the thigh, and more thinly ſcattered, but more diſtinctly ſeen upon the outer part. In colour and appearance, when in their natural ſtate and collapſed, they reſemble looſe muſcular fibres; being flat reddiſh lines, moſt diſtinctly and ſtrongly muſcular in their colour, and pellucid only when diſtended with air. When theſe veſſels are ſnipped obliquely with the ſciſſars, or punctured with the lancet and blown up, or injected with mercury, they take a very peculiar appearance; for they ſwell only betwixt their valves, whilſt the valves ſeem to cut them into beads irregularly joined. But the drawing will be more ſatisfactory than any deſcription.

LYMPHATIC GLANDS.—At the groin, immediately under the ſkin, on a level with the lymphatics, and above the faſcia and cutaneous veins, we find the congeries of lymphatic glands. But all the inguinal glands are not this ſuperficial; on the contrary, many are ſunk amongſt the condenſed cellular membrane, which, mingled with the aponeurotic membranes, forms a bed covering the femoral artery and vein.

VEINS.—The ſaphena vein, we are told, lies above the faſcia; the great femoral vein below it. This is true; but it muſt at the ſame time be underſtood with ſome limitation. About ſix inches from the groin (if merely the ſkin have been diſſected back) we can only ſee the ſaphena vein ſhining faintly through the faſcia, even in the leaneſt ſubject. It comes up upon the inſide of the knee and thigh, and does not dive ſuddenly under the faſcia, but is gradually enveloped, and more firmly embraced, by the fibres of the faſcia; which at the fore part of the thigh is ſplit into layers, and ſo filled with the adipoſe membrane and fat, that it might be more juſtly eſtimated as condenſed cellular membrane. Farther down upon the thigh, again, on the inſide of the vaſtus internus muſcle, the more natural connection of this vein is with the cellular membrane, being immediately attached to the ſkin, and having no kind of protection.

NERVES.—Above the faſcia of the thigh ſeveral delicate and extenſively prolonged nerves are ſeen.

1ſt, Upon the inner and upper part of the thigh, branching to the ſcrotum, teſticle, and pubes, is the INGUINAL NERVE, conſiſting of delicate twigs, which come by a circuitous courſe, and are derived by very delicate twigs from the firſt and ſecond lumbar nerve. Within the belly it may be ſeen coming out betwixt the pſoas and iliacus internus muſcles: it winds round part of the ſpine of the os ilium and inſide of the ligament, and pierces the ligament, and appears upon the pubes.

2dly, The INTERNAL CUTANEOUS NERVE comes out from Paupart's ligament above the crural veſſels, and is largely diſtributed upon the inſide of the thigh, extending its branches round upon the internal condyle of the os femoris and patella. It is a branch of the anterior crural nerve.

3dly, The MIDDLE CUTANEOUS NERVE *, from the ſame ſource with the laſt, comes out from the point marked by the ſartorius muſcle, croſſing the head of the rectus muſcle. It is diſtributed upon the fore and middle part of the thigh.

4thly, The EXTERNAL CUTANEOUS NERVE, derived from the third lumbar nerve, appears upon the outſide of the thigh, a little below the lower ſpinous proceſs of the os ilium; and dividing into branches, one runs round the back and outer part of the thigh, and the other runs down the faſcia, where it covers the vaſtus externus and outſide of the rectus muſcles.

Theſe veſſels and nerves have been mentioned before deſcribing the faſcia more particularly; as we muſt be aware of them in the firſt cut of the knife, or they are loſt to us for ever.

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* Some very minute nerves from the deeper branches of the anterior crural nerve join thoſe; but they may be overlooked in the general arrangement.

Were the thigh to be diſſected, in order to ſhow the faſcia only, I ſhould recommend it to be done firſt, by laying the faſcia bare upon the outer ſide, where it is ſtrong, and ſmooth, and tendinous, and where the ſtudent can form a confirmed idea of its nature; and then, by diſſecting it carefully inwards to the more ſoft and delicate fore part of the thigh, where the faſcia is with difficulty diſtinguiſhed from the common cellular membrane: I would even leave it there, and begin again to take the ſkin off from the inſide of the thigh, where, although the faſcia is not nearly ſo ſtrong or well defended as on the outſide, it is yet more ſo than in the middle part above the great veſſels; and commencing anew from Paupart's ligament, I would diſſect downwards over the inguinal glands and veſſels. When a knowledge of the parts, and of their appearance, is once thoroughly obtained, it is no longer of conſequence how we proceed; but in a firſt diſſection, we are apt to lift membranes, which, being diſſected up from within outwards, the whole faſcia will inadvertently be diſſected off.

EXPLANATION OF PLATE XIII.

In the ſubject from which this was drawn the parts were lean and extenuated, without any full outline or maſs of muſcular fleſh: and, in order to ſhow the parts for which this figure is intended, the nerves, cutaneous blood-veſſels, and lymphatics, ſuch a ſtate of the ſubject is required.

A, The TENDON of the EXTERNAL OBLIQUE muſcle of the abdomen. The manner in which it is tied down by the faſcia (C), and the way in which it forms the ligament of the thigh, and is inſerted into the os pubis (D), may be obſerved here.

B, The UPPER SPINOUS PROCESS of the OS ILIUM.

C, Tendinous fibres, communicating betwixt the tendon of the abdominal muſcles and the faſcia lata.

D, The OS PUBIS, cut very near its ſymphiſis.

E E, CELLULAR MEMBRANE, which, mingling with the faſcia in ſome ſubjects, almoſt totally obſcures its nature. In this web of cellular membrane, ſtretching over the great veſſels of the thigh, many lymphatic glands are ſituated F F F; and it is complicated with the cutaneous nerves, veins, and lymphatics.

G, Great origin of the FASCIA LATA of the thigh. At this place it includes in its duplicature the FASCIALIS MUSCLE; which, taking origin from the upper ſpinous proceſs of the os ilium, ſpreads down the thigh betwixt the plates of the faſcia. The FASCIA, in the direction of the muſcle, goes down the outſide of the thigh, very ſtrong; and, like a broad tendon, is inſerted into the external condyle of the thigh bone.

H, The FASCIA upon the inſide of the thigh, where it covers the gracilis muſcle. Here it is much thinner, but not ſo lax as in the middle part of the thigh and in the tract of the great veſſels.

I, The origin of the GRACILIS MUSCLE from the os pubis.

K, The VASTUS EXTERNUS MUSCLE.

L, The VASTUS INTERNUS MUSCLE.

M, The RECTUS MUSCLE. Theſe three great muſcles are ſeen ſhining of a darker colour through the faſcia, while the interſtices of theſe muſcles are marked by a lighter and more fatty line, like the linea alba and ſemilunaris of the abdominal muſcles. And here, as in the belly, the faſcia takes a firmer hold of the cellular membrane below, and ſends down fibres betwixt the muſcles.

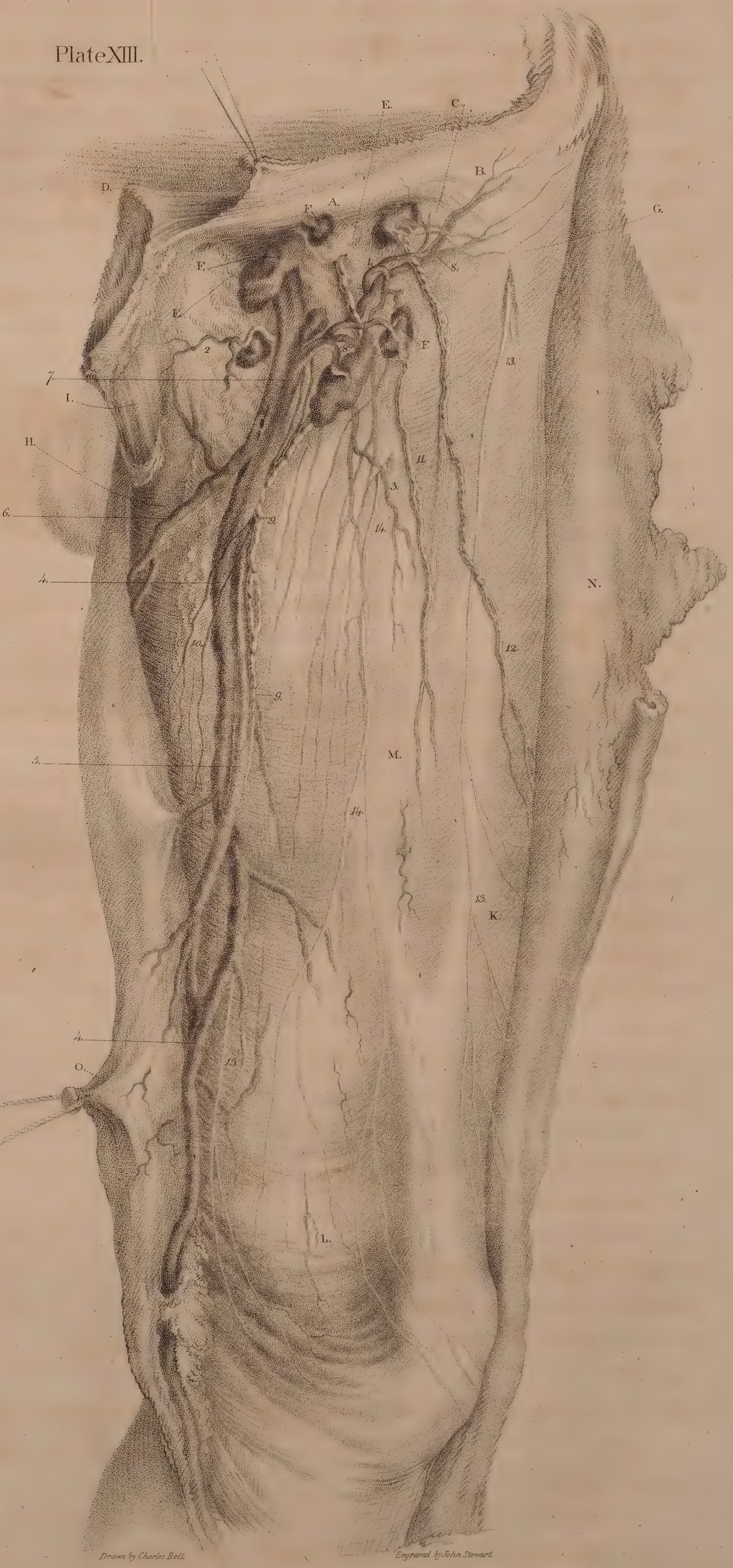
N, The INTEGUMENTS diſſected back from the outſide of the thigh.

O, The INTEGUMENTS which cover the inſide of thigh held out, ſhewing the cutaneous branches of the vena ſaphena.

NERVES AND VESSELS.

1. A ſuperficial branch of the femoral artery, ſupplying the glands, fat, and ſkin of the groin.
2. A branch of the ARTERIA PUDICA EXTERNA going to the genitals.
3. A third cutaneous branch, ſupplying the integuments upon the fore part of the thigh.

Plate XIII.



Drawn by Charles Bell.

Engraved by John Stewart.

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4. The VENA SAPHENA in its courſe on the inſide of the thigh; where it is very ſuperficial, lying betwixt the ſkin and faſcia, and involved in the intermediate cellular membrane.

5. A very conſiderable branch joining the ſaphena vein. Theſe are ſeen a little twiſted by the pulling of the ſkin.

6. Another cutaneous vein coming round from the inſide and upper part of the thigh.

7. The trunk of the SAPHENA VEIN, before it goes under the faſcia to join the great femoral vein. It has been already remarked, that this vein does not plunge ſuddenly under the faſcia, as generally deſcribed; but is gradually encompaſſed with firmer cellular membrane as it aſcends.

8. Branches of veins belonging to the inguinal glands.

9. One of the numerous lymphatics which accompany the ſaphena vein injected. It appears knotted, or irregularly jointed when inflated or injected.

10. Several of theſe lymphatics lying collapſed: they appear in general as obſcurely reddiſh lines, parallel and ſtraight in their courſe.

11, 12. Other lymphatics injected.

13. EXTERNAL CUTANEOUS NERVE.

14. MIDDLE CUTANEOUS NERVE.

15. INTERNAL CUTANEOUS NERVE.

OF THE SUPERFICIAL PARTS SEEN IN THE FIRST DISSECTION OF THE THIGH CONSIDERED AS SUBJECT TO DISEASE.

IT has been already explained, that, in treating of morbid anatomy, it is intended, not merely to include the diſeaſed ſtate of the viſcera, but alſo the derangement of the natural anatomy of the extremities and external parts, whether by violence or by diſeaſe, with the conſequences of their derangement to health and life. In the review of the parts before us now, we have more to obſerve than might ſeem ſtrictly to belong to ſo limited a diſſection; for I ſhall here conſider the diſeaſes of the cutaneous veins, and nerves, and faſcia in general.

INFLAMMATION AND DISEASES OF THE CUTANEOUS VEINS.—Although it might have been expected that the ingenious paper of Mr. Hunter, upon the Inflammation of Veins, ſhould have excited general attention, and have been followed up by further obſervations, we do not find that any progreſs has been made in their pathology ſince that time. He pointed out the effect of inflammation upon veins; ſhewed, by diſſection, how it was propagated alongſt their cavities after amputation, bad compound fractures, and extenſive abſceſſes; proved that matter was ſometimes formed in them; and that, in general, the conſequence of the inflammation was to produce partial or interrupted adheſions of their inner coats, preventing the matter from paſſing into the tide of blood. At the ſame time, the poſſibility of matter thus formed mixing with the blood, and being driven to the heart, was explained. "I have ſeen (ſays he), from a "wound in the foot, the vena ſaphena inflamed all up the leg and thigh, nearly as high as the groin; and "I have been obliged to open a ſtring of abſceſſes almoſt through its whole length." In other inſtances, after ſimilar injuries, he found the inner ſurface of the veins furred over with coagulable lymph*. Theſe obſervations of Mr. Hunter are given in illuſtration of the effects produced by accidents in blood-letting, and as eſtabliſhing a new principle upon which to explain the ſtrange ſeries of ſymptoms which

* The inner coat of arteries has, in ſome inſtances, ſhewn a degree of inflammation, propagated in a retrograde courſe to the heart, as after the operation for aneuriſm.

ſometimes take place after bleeding. In this view we ſhall afterwards have occaſion to attend to theſe facts; but in the mean time we may proceed to the conſideration of other conſequences of the injuries of veins.

It has been already explained how the preſſure of the uterus, or of an adventitious tumor in the pelvis or groin, may diſtend the veins of the leg, merely by increaſing the reſiſtance to the circulation without any diſeaſe or failure in the energy of the coat of the veins. In old people, again, ſuch diſtenſion has an evident connection with the general plethora of the venous ſyſtem, and, in all probability, with a failure of that greater degree of reſiſtance which the veins of the lower extremities ſhould poſſeſs, and which is required in them to keep the balance of the ſyſtem, and counteract the preſſure of the column of blood.

But the dilatation of the cutaneous veins is not confined to ſuch caſes as theſe; for we find that in younger men the veins are often variouſly diſeaſed; that ſometimes they are varicoſe, not unfrequently degenerating into tumors, which, amaſſing the blood, affect the neighbouring parts, and form a dangerous diſeaſe. Sometimes, again, influenced by the contiguity of diſeaſe, they become tortuous and enlarged round the baſe of ſome tumors, or the margin of callous ulcers, forming in many inſtances their moſt characteriſtic feature.

Since we know that the natural capacity of the veins muſt depend upon the juſt mean of their reſiſtance to the action of the heart and arteries, we cannot be at a loſs to conceive how diſeaſe ſhould ſo weaken the elaſticity and power of reſiſtance of their coats as to allow them to dilate; and (as their dilatation is in length as well as in diameter) to become conſequently varicoſe and tortuous. To illuſtrate this, let us take the following outlines of a caſe: A young gentleman, eager in country amuſement, was, in ſcrambling amongſt bruſhwood, pricked with a thorn in the ſaphena vein, where it gathers its branches upon the inſide of the leg. He was not ſenſible of receiving the injury at the time; but, upon returning home, the family obſerved blood running down his ſtocking; and, upon examination, he found the prickle ſticking in the vein. He, of courſe, thought little of it; but it feſtered, and looked unkindly for ſome time. By and by, a little tumor formed upon the part; and further up the limb, the veins in ſucceſſive ſtages became enlarged, with varicoſe circles of veins inſulated apparently at firſt, and forming diſtinct tumors in the courſe of the ſaphena and its branches. Can there be a doubt, that in this caſe the varicoſe enlargement was a conſequence of the injury received, any more than that in other inſtances inflammation and ſuppuration are the effect of injury? We are accuſtomed to find contraction and thickening as the conſequences of inflammation: both of theſe took place here, and are not incompatible with partial dilatations. All varicoſe enlargements (and I regret never having had an opportunity of diſſecting the veins in ſuch a ſtate) are to the feeling irregularly hard. There is a deficiency felt at intervals; a pitting into which the finger ſeems to ſink, with hard incompreſſible edges. Theſe indurations are more probably formed by the indurated coats in the abrupt angles of the branches than by concreted blood.

A ſtate of the veins, not it is to be hoped ſtrictly analogous to the laſt caſe, but illuſtrated by it, ſometimes takes place without any apparent cauſe. Tumors will gradually ariſe from veins, which, upon diſſection, are found to contain only a confuſed maſs of coagulated blood and mucus, blending all diſtinction of bones, membranes, and muſcles. Such tumors will ſometimes ſeem to take their origin from the bones, being ſmall, inert, firm tumors, at firſt; but, by ſlow progreſſion, aſſiſted perhaps by the means uſed to bring them to ſuppuration, increaſing till, upon a raſh attempt to extirpate them, it will be found that they are interſected with lamellæ of bone, and that it is abſolutely neceſſary, from the confuſion of diſeaſed parts, to finiſh the operation by the amputation of the limb.

We ſhould perhaps claſs with theſe laſt, ſuch tumors as, appearing at birth hardly raiſed above the common integuments, gradually dilate as childhood advances, form evidently varicoſe tumors, having an irregular knobular ſurface, and increaſing in the brightneſs of their hues, purples and red, bleed in their ad-

vanced ſtage, and require operation. Such ſpongy tumors being allowed to increaſe too much, and take a firm ſeat upon the bones, will generally, though extirpated, regenerate. In the operation there is much bleeding; the tumor is, when cut into, like a honeycomb; and the arteries, as if emptying into theſe ſacs, ſend out their blood with great force. I have ſeen ſuch tumors on the head, under the chin, and on the belly; though they occur, I believe, more commonly on the ſpine, in the back or neck. The general opinion ſeems to be, that they ariſe from injury done to the child in the womb; an opinion having no foundation but in the deſire to explain every thing.

But let me not be underſtood to ſay, that ſuch a tumor is ſimply a congeries of varicoſe veins; for it is evident, that in theſe caſes, as in other more familiar examples, there is a local diſeaſe acting upon the neighbouring veins, and drawing them into diſeaſe, allied in its nature to proper cancer. Thus we ſhall find a tumor growing from ſome fleſhy part, hard and knobular, with diſtorted veins, with a fretting ſore upon its moſt prominent part, and bleeding, ſometimes an acknowledged cancer, yet differing in no very definite character from thoſe of which we have been ſpeaking.

Diseases of the lymphatics.—The ſuperficial lymphatics point out to us, in ſome inſtances, the nature of diſeaſe; for, being extremely ſuſceptible of inflammation, they apprize us of infection, and lead us by a hard inflamed line to the neighbouring glands. This effect of local poiſon and inflammation on the abſorbent veſſels has been long obſerved; being one of the great proofs of the theory of abſorption. But more lately, Dr. Ferrier of Mancheſter, has endeavoured to prove a more general affection of the lympha-tics of the leg and thigh in thoſe ſwellings incident to women after childbirth. In the writings of that gentleman, we have much to admire; but in a mind inquiſitive and ingenious, there is a natural bent and facility of generaliſing facts and obſervations, perhaps immature or haſtily adopted. It will perhaps appear to an unbiaſſed mind, that the ſtate of the limb in theſe caſes is more of the nature of a critical ſwelling, than a merely local affection; and that the obſtruction and inflammation of the lymphatics of the limb may be more naturally explained, upon the idea that this inflammation is ſympathetic, and communicated from the extremities of the lymphatics to their trunks, than that the diſeaſe is primarily in the lymphatics, and that their affection is the cauſe of the ſwelling of the limb.

Another inſtance of diſeaſe in the lymphatics, has been communicated to me by Dr. Rutherford; a man eminently diſtinguiſhed for a perfect command of information on all profeſſional ſubjects, and who joins to this the happieſt talent of illuſtration, which a varied and comprehenſive knowledge can ſupply.—After violent and long continued exerciſe, where any part of a limb has been expoſed to continued friction (as the inſide of the leg or thigh after having been long on the ſaddle), the lymphatics are liable to inflame; when a hard chord may be traced in their courſe alongſt the limb to the neighbouring glands. This takes place without any leſion of the cuticle or the ſmalleſt ulceration; but it ſeems to be the mere effect of the continued friction of the coats of the veſſel which makes them become fretted and inflamed. In a caſe of a riding groom, which occurred in the Infirmary here, the inflamed lymphatics were ſo ſwelled and tender in their courſe upon the inſide of the thigh, and in the glands of the groin, that the man could not move without excruciating pain.

What the appearance of the lymphatics in ſuch great inflammations may be, we can ſay only from analogy; for they have been little attended to in morbid diſſection: but when we conſider that their activity muſt be influenced by a ſtimulus propagated from their abſorbing mouths to the trunks of the ſyſtem, we have rather to wonder that inflammation and diſeaſe ſhould be ſo ſeldom excited in them. Accident ſhews what from theory we are led to conceive, viz. that the fluids in the lymphatics are accelerated by the action of the muſcles; for when in wounds a large lymphatic is laid open, and continues to diſcharge after the ſurface is healed, we may obſerve a guſh or acceleration of the diſcharge upon any exertion of the limb. This accident, from the puncturing of a lymphatic, muſt happen in every the moſt ſuperficial

incision, but is not generally obſerved till the ſore is healing; when, from the tumefied extremity of the veſſel, the fluid is ſeen diſcharging as from the head of a pimple, and ſo abundantly as quickly to moiſten the dreſſings. Upon the continuance of this diſcharge, aſtringents are generally applied; but they ſometimes fail: and many caſes in collections ſhew, that the diſcharge continues obſtinate under theſe remedies. A caſe occurring under Dr. Rutherford, of a wound in the fore part of the leg with an adze, was very ſimply cured by preſſure below the wound in the tract of the lymphatic.

Of the fascia.—Every one is aware of the bad conſequence of tight bandaging in inflammation; and that where the parts are ſwelling under an unelaſtic bandage, the inflammation is increaſed, great pain is excited, and the member is very apt to fall into gangrene. Nearly the ſame conſequences, in a leſſer degree, are frequently to be looked for from the binding of the faſcia in deep ſeated inflammation. For the muſcular parts ſwelling, as after penetrating wounds, and being confined by the ſtrong embraces of the faſcia, eſpecially in the thigh and fore arm, it cauſes excruciating pain, with contractions of the limb. The elaſtic feeling which this tenſion of the parts gives to the touch in the firſt ſtage of inflammation, conveys the ſenſation of matter beneath, which is a frequent miſtake. In abſceſs, the faſcia being of a more inert texture, not ſo readily partaking of inflammation and ſuppuration as the ſubjacent ſofter parts, confines the matter, and cauſes it to ſpread more extenſively amongſt the looſe cellular membrane.

It was long believed, that in punctured wounds the bad ſymptoms were owing to the extreme ſenſibility in the tendinous parts when wounded; but they are now more univerſally attributed to wounds of the cutaneous nerves; while another and diſtinct train of ſymptoms follow the ſwelling of the inflamed parts, while ſtrictly embraced by the faſcia. The faſcia itſelf, though inſenſible in its healthy ſtate, and ſlow to inflame, is yet difficult of reſolution when it does inflame, becoming thickened and contracted; the cure being only to be accompliſhed by a free inciſion. It is this which makes the knowledge of the faſcia ſo peculiarly neceſſary to the ſurgeon. If he be ignorant of the courſe and connections of this membrane, he will make many fruitleſs inciſions before he cuts the faſcia ſo effectually as to take off the tenſion from the limb.

OF THE LIGAMENT OF THE THIGH, AND ITS CONNECTION WITH THE ABDOMINAL RING.

Some perhaps may cenſure the frequent recurrence of the ſame ſubject; but if it be remembered, that the method of diſſecting, and the views we have of the parts, eſſentially affect our underſtanding of them; and that, to acquire a thorough knowledge of ſome of the moſt important points, we ſhall more readily ſucceed, by ſimplifying our purſuits, it will rather appear that to vary thus the object of our diſſection, according to the views which our previous enquiries ſuggeſt, will, in the end, enable us to form a juſter eſtimate than if our firſt efforts were bewildered by too great a latitude of enquiry.

It matters not whether the femoral ligament be conſidered as a diſtinct ligament, or as the tendon of the external muſcle of the belly; but the latter ſuppoſition makes the more ſimple explanation.

The flat tendon of the external oblique muſcle of the abdomen, after a careful diſſection, and when viewed from without, is ſeen (upon its lower part) ſending its fibres obliquely downwards to the os pubis; and when approaching that bone, ſplitting, in order to give exit to the ſpermatic chord. The tendinous fibres are ſeen croſſing again, after having formed the ring. It has been conceived, that this decuſſating of the fibres makes a proviſion againſt hernia; and that the violent actions of the abdominal muſcles, which muſt preſs upon the viſcera, have a tendency at the ſame time to draw together theſe decuſſating fibres, and prevent the inguinal hernia. But, by a ſtricter attention to the parts, it will appear, that their

conſtruction is ſuch as to preclude the deſcent of the viſcera when there is no preternatural laxity or malconformation.

The ligament of the thigh is formed by the tendon of the external oblique muſcle of the abdomen taking a firm hold of the ſpinous proceſs of the os ilium, and ſtretching over the muſcles and arteries of the thigh to the os pubis. On the outer part, as it riſes from the os ilium, it is very firmly tied down by its connection with the faſcia of the thigh. In its whole length, but chiefly as it approaches the pubes, it is not the rounded tendon which, from viewing it on the outſide, we ſhould expect; but it is turned in and inſerted into the os pubis with a flat broad horizontal tendon. The conſequence of this is, that at the point towards which the viſcera muſt gravitate in the erect poſture of the body, it is very ſtrongly ſecured: and that the effort of the viſcera to protrude is not made under the arch or ligament, but above it; ſince the margin of the tendon ſpreads thus horizontally to be inſerted into the os pubis.

The ſpermatic chord lies as in a groove formed by the ligament as it approaches the os pubis; and as the extremity of the ligament forms the lower pillar of the ring, an exit is, by a peculiar yielding or twiſting of its more outward fibres, allowed for the chord, without diminiſhing the ſtrength of the femoral ligament, which, by its horizontal ſheath ſtretching backwards, is firmly inſerted into the bone. Thus the ſpermatic chord is not ſubjected to the compreſſion of the two pillars of the ring; for as the lower pillar of the ring is the extremity of the femoral ligament, as from its connection with the bones it is immoveable by the action of the abdominal muſcles, and as this lower pillar holds the chord in a kind of flat groove laid horizontally on the os pubis, its outward fibres only yielding to allow the chord to eſcape, the conſequence is, that the upper pillar (which ſpreads its fibres on the outſide of the lower) does not, when made tenſe by the abdominal muſcles, compreſs the chord againſt the lower one. On the other hand, the ſecurity of the abdominal ring depends upon the obliquity of the paſſage, and upon the preſſure of the viſcera not being made in the direction of the chord, but laterally.

DISSECTION OF THE FEMORAL ARTERY IN THE GROIN.

In proceeding to diſſect away from the groin the glands and fat (as ſeen in Plate XIII.), we ſhall find a few delicate ſuperficially diſtributed nerves coming from under the ligament of the thigh. We ſhall find alſo, that the cellular membrane which ſurrounds the great veſſels forms a condenſed bed, independently of an aponeuroſis upon the ſubjacent muſcles. The inner ſurface of this cellular membrane is ſtrong from the interlacing of fibres. It covers and inveſts the great artery and vein. The ſame condenſed cellular membrane is continued behind the vein and artery; and by pulling up theſe veſſels, after diſſecting it back from before them (as in Plate XIV. fig. 1.), their branches may be ſeen piercing it like the veſſels of the heart going out from the pericardium. All the veſſels in the body are more or leſs ſupported in this manner by ſheaths of cellular membrane; but it is at ſuch places as this in the groin that it becomes a great object in ſurgical anatomy. In bringing the parts into the ſtate preſented in Plate XIV. fig. 1. if the ſubject be in a favourable condition, very large lymphatic veſſels may be obſerved courſing obliquely over the great artery, and running parallel to its conſiderable branches.

EXPLANATION OF PLATE XIV. Fig. 1.

A, Paupart's ligament, formed by the external ſheet of tendon of the abdominal muſcles.

B, The cellular substance, filling up the angle in the groin above the iliacus internus, pſoas, and pectenalis muſcles.

C, The condensed cellular membrane, incloſing the femoral artery, diſſected back and held out by

a hook. This ſheath conſiſts partly of the common adipoſe membrane, partly of the layers of the great femoral faſcia.

D, A ſolitary LYMPHATIC GLAND left.

E, The OS PUBIS.

F, The SPINE of the OS ILIUM.

G, The SARTORIUS MUSCLE.

H, The GRACILIS MUSCLE.

I, The firſt head of the TRICEPS muſcle, or ADDUCTOR LONGUS.

K, The third head of the TRICEPS, or ADDUCTOR MAGNUS.

ARTERIES AND VEINS.

1. The FEMORAL ARTERY at its moſt prominent part.

2. The GREAT FEMORAL VEIN, after being joined by the greater ſaphena vein.

3. The EPIGASTRIC ARTERY, emerging from the cellular membrane, and going up behind the tendon of the abdominal muſcles. Betwixt this artery and the point B is the ſeat of the femoral hernia.

4. A ſuperficial branch of the femoral artery, ſupplying ſeveral of the lymphatic glands, the cellular membrane, and upper part of the ſartorius muſcle.

5. Another ſuperficial branch, tending more inwardly to the integuments of the private parts, and called PUDENDA EXTERNA. (See next Plate.)

6, 6. The great diviſions of the ARTERIA PROFUNDA femoris, ſeen piercing the involving membrane.

7, 7. Muſcular branches, ſupplying the ſartorius.

8. Muſcular branches, ſupplying the triceps.

9. The ANTERIOR CRURAL NERVE. It is ſeen branching amongſt the muſcles, and following the arteries in their great diviſions.

10. Branches of the OBTURATOR NERVE, ſeen deep amongſt the adductor muſcles.

OF TUMORS IN THE GROIN.

UNDER this title it is not meant to give ſuch a hiſtory of the great varieties of tumors which occur in the groin as properly belongs to books of ſurgery; but merely to mark their moſt prominent diagnoſtic features, as illuſtrated by a knowledge of the anatomy. Theſe, when the parts are before us, make an impreſſive and important leſſon.

The diſeaſes which may be miſtaken and confounded are, femoral or crural hernia with inguinal hernia; bubo with femoral hernia; common ſcrophulous abſceſſes of the inguinal glands with the lumbar abſceſs; and lumbar abſceſs with diſeaſe of the hip-joint.

It is not at every point under the ligament of the thigh that the femoral hernia is found to protrude; but only at that point where the ligament is leſs firmly tied down, where the cellular membrane is looſer, betwixt the femoral artery and vein and os pubis. This, it may be obſerved, is a ſmall outlet, ſtrictly embraced by the crural veſſels and epigaſtric artery on the outſide, and by the firm inſertion of the ligament into the os pubis on the other. It is immediately in the bend of the groin, and towards the inſide; ſo that it is very near the ſeat of the inguinal hernia. And when a femoral hernia in a male is ſmall, and comes down ſuddenly, and is attended with much inflammation, eſpecially if the patient be corpulent, having much fat upon the pubes, the tumor ſo ſpreads upwards, and becomes ſo tender, that it cannot be freely handled; and it is often a difficult matter to ſay preciſely whether it be a femoral or an inguinal hernia. In all the other inſtances of diſeaſe in this part, and in general in the femoral hernia, the ring and the ſpermatic chord remain free, ſo that no room is left for doubt. In the diſeaſes of the

Plate XIV.

Fig. 1.

Fig. 2.

Drawn by C. Bell & Engr.d by J. Stewart.

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ſpermatic chord, hydrocele of the chord, or varicoſe enlargement of its veins, the abſence of the more urgent ſymptoms of ſtrangulation undeceives us, though the tumor ſhould reſemble hernia. But in the queſtion, Whether it be femoral or inguinal hernia? as the ſymptoms of ſtrangulation may originate from either, we are left to determine from the local appearance. The difficulty is, however, of no great importance, as our operation has only to be the more cautiouſly conducted in the firſt ſtage.

If a patient with a bubo or GLANDULAR SWELLING, immediately in the ſeat of hernia, ſhould at the ſame time be attacked with ſymptoms reſembling thoſe of ſtrangulation, as vomiting or want of paſſage by ſtool (a caſe by no means unlikely), it may become extremely difficult to determine upon the caſe, notwithſtanding the lightneſs with which it is commonly mentioned. I have not ſeen a bubo miſtaken for a hernia; but what is more extraordinary, I have ſeen a hernia, and an inguinal hernia too, miſtaken for a bubo. The tumor extended down from the ring upon the groin; was ſmall and circumſcribed; and ſo violently inflamed, that it ſeemed upon the point of ſuppuration. But the moſt deceiving circumſtance was, that the patient was not reduced; he was ſtrong, and walked ſtoutly, inſomuch as to make his eſcape from the ſurgeons. It was naturally conceived, that if it had been a hernia ſo far advanced, the patient muſt have been more reduced, and every ſymptom of ſtrangulation more urgent. But the man died afterwards, and I ſaw the diſſection.

Herniary tumors are ſoft and elaſtic at firſt, and become firm and more incompreſſible upon the approach of ſtrangulation. Glandular tumors are in general very hard in their commencement, circumſcribed, and moveable; and before they have attained a ſize which can be miſtaken, become ſofter, more prominent, and diſcoloured: when matter is formed, it is ſufficiently evident. I ſuſpect, that in the caſe of hernia which I have mentioned above, the inflammation, which occurred ſo early, had been an eryſipelatous affection, occaſioned by the attempts to reduce the gut. It appeared dark, and like inflammation verging to ſuppuration.

The LUMBAR ABSCESS appears in the groin, commonly upon the outſide of the femoral artery, under the ſtronger part of the faſcia, and nearer the os ilium. When the tumor forms ſlowly and regularly, the faſcia can be plainly felt; and when it is far advanced, and the faſcia gives way, the deficiency is plainly felt with the tenſe edges of the faſcia. The lumbar abſceſs, however, does not always point thus regularly, but is more extenſively diffuſed in the groin, even ſurrounding and including the femoral veſſels; or it runs ſo deeply amongſt the muſcles, that the lancet or trochar cannot reach it with ſafety. In the dead body, upon laying open the abſceſs in the thigh, and freeing it of matter, a new diſcharge is ſeen to come from within the belly. Upon following this ſinus, it is found to run up behind the pſoas muſcle, upon the vertebræ of the loins, and down the os ſacrum; and theſe bones are generally carious. In ſome inſtances the abſceſs continues its courſe by the ſpine and ſide of the inteſtinum rectum, and points by the ſide of the anus. We ſee ſometimes the diſeaſe advancing to terrible lengths, yet the patient's life of ſuffering is prolonged; the ſpine becomes curved, the belly tenſe, the whole hip is included in the abſceſs, the matter having inſinuated itſelf round the faſcialis muſcle, and down to the head of the thigh bone.

The ſuppuration of the inguinal glands ſimply, where there is no communication with the internal parts, may be known by the hiſtory of the diſeaſe. A ſcrophulous diſeaſe of theſe glands will commence by thin induration and cluſtering, and advance ſlowly to ſuppuration. In general, though not always, the lumbar abſceſs will be marked by the greater tenſion and prominency in the erect poſture, in conſequence of the gravitation of the matter from the loins.

Collections in the hip-joint may protrude in ſuch a manner upon the groin, as to be miſtaken for abſceſs of the glands, or lumbar abſceſs. The affections of the joint are ſo peculiar, however, that they cannot be long miſunderſtood. Inflammation and diſeaſe of the joint is almoſt of neceſſity attended with an elongation of the thigh, by the filling up or diminution of the cavity of the acetabulum and elongation of the capſular ligament. In a general affection of the joint from injury, the ſwelling is very

general, and reaches up within the belly; it is of a very peculiar firmneſs, and incompreſſible nature, like bone or cartilage, about the ſtrong tendons and faſcia in the outſide of the haunch.

OF THE ANATOMY OF THE FEMORAL HERNIA.

The frequent occurrence of the femoral hernia muſt impreſs us ſtill more forcibly with the importance of this piece of anatomy. Upon recollecting the natural ſtate of the parts, there will be no difficulty in diſtinguiſhing their relative ſituation.

In a recent hernia of the thigh, the tumor is in general ſmall. Very often during the life of the patient it is to be diſcovered only by the ſymptoms, not by the ſwelling in the groin; and theſe herniæ are the moſt dangerous and ſuddenly fatal.

If the rupture have been ſuddenly fatal, then proportionally there is leſs derangement of the natural anatomy; for it is little altered but by the effect of inflammation. The faſcia will be found tenſe and ſtretched over the tumor; the tumor is formed in a bed of inflamed cellular membrane; and the fibres of the faſcia, mingling with the condenſed cellular ſubſtance, need to be cut through before we arrive at the ſac which is formed by the peritoneum. If the thigh have been injected, and the tumor be conſiderable, we find the external pudic artery *, and inguinal cutaneous branches, ramifying upon the ſac, chiefly upon the ſide next the pubis. The femoral hernia, coming from under Paupart's ligament, does not ſtretch down upon the thigh, but turns up upon the belly; ſo that we may miſtake it for the inguinal hernia, and the turning up of the tumor upon the ligament makes it more difficult to enlarge the ſtricture in the operation.

A celebrated author has ſaid, that the femoral hernia is leſs apt to be ſtrangulated than the hernia of the ring: but it is evident, that the latter is comparatively leſs liable to occaſional derangement. For not only is the ſtrangulation of the ſpermatic chord prevented by the mechaniſm of the parts when in their natural ſtate, but even in hernia (eſpecially where it has continued for ſome time) the extenſion of the fibres of the external oblique, round the margin of the ring or neck of the ſac, is ſuch, that before the action of the abdominal muſcle can pull them, ſo as to compreſs the ſac, it is held in check by thoſe fibres, which continue in a direct line. Or, in other words, the paſſage through the tendon of the abdominal muſcle is not ſuch as we ſhould conceive from a rupture ſplitting the parallel fibres, and obtaining a paſſage liable to compreſſion, by the extenſion and conſequent approximation of thoſe fibres; but, on the contrary, the fibres are gradually elongated as the rupture protrudes and increaſes; thus forming a circular opening, extending outwards and downwards conically, ſo as not to be liable to compreſſion by the action of the muſcles. The parts about the ring, too, it may be obſerved, are not ſuch as to inflame ſo readily as thoſe in the arch of the thigh.

Under the ligament of the thigh, there being much vaſcular cellular membrane and glands, there muſt be produced great ſwelling and ſudden tenſion, upon inflammation being communicated to that part; while the occaſional action of the muſcles going out from the pelvis, with the tenſion of the faſcia, in the various poſtures of the body and actions of the limbs, muſt be a frequent exciting cauſe, yet I believe the remote cauſe of the ſtrangulation to be more generally in the ſtate of the bowels.

In operating for the femoral hernia, there are two points of the anatomy of much importance: Firſt, the knowledge of the membranes which inveſt the tumor, and which muſt be carefully attended to in the external inciſion: And, ſecondly, the danger which attends the ſecond ſtage of the operation in cutting the ligaments of the thigh, to free the gut from ſtricture.

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* In inguinal hernia, where the tumor frequently acquires a great bulk, the external pudic (a branch from the femoral artery) is greatly enlarged, and extenſively diſtributed over the ſac.

EXPLANATION OF PLATE XIV. FIG. 2.

In illuſtration of the firſt object, the ſecond figure of the annexed Plate is given, in which there is an external view of the parts after a full diſſection.

A, The FEMORAL LIGAMENT, making the ſtricture upon the protruded parts. The hernia is in the uſual place, betwixt the femoral veſſels and the inſertion of the ligament into the os pubis.

B, CELLULAR MEMBRANE, lying upon the pectenalis muſcle. It is evident, even in this view of the parts, how ſtrictly the hernia is embraced by the ligament at A, and the cellular membrane B, upon the one ſide; and the crural veſſels and epigaſtric artery, and the ſtronger connections of the ligament with the faſcia lata, on the other. Even Pott ſpeaks as if we had all the ſpace betwixt the pubes and ſpine of the os ilium " to manage the reduction in."

C, TWIGS OF ARTERIES from the femoral artery (probably a branch of the upper external pudic artery), diſtributed to the ſac.

D, INGUINAL GLANDS.

E, A coat of condenſed cellular membrane, external to the peritoneal ſac. Upon the firſt view of the tumor, on laying back the integuments, the faſcia was continued in fibres from the outſide upon this ſac of cellular membrane, ſo as to form a continued ſheet, holding the hernia embraced amongſt the cellular membrane.

F F, The PERITONEAL SAC, conſiderably thickened.

G, The INTESTINE, a portion of the ilion. If we were to imitate the colour, it would require a deep purple, with a light tinge of lake over it.

The death of the perſon from whoſe body this drawing was taken, was occaſioned by the ſtrangulation of the gut. If this had been a male ſubject, a view from the inſide would have been given, ſhewing the relative ſituation of the chord, epigaſtric artery, and mouth of the ſac: but the femoral hernia is a rare occurrence in man. The conſequence of inflammation, as examplified in the preſent caſe, is the matting together of the cellular membrane. Even the femoral artery, and vein, and glands, were embraced by firm unelaſtic fat.

In Plate XV. the dangers of the ſecond ſtage of the operation are pointed out.

FURTHER DISSECTION OF THE ARTERIES AND NERVES OF THE THIGH.

IT is needleſs to make a parade of the importance of this diſſection: the next diviſion of our ſubject, which treats of the ACCIDENTS AND DISEASES, will ſufficiently evince it.

As we have now to diſſect back the general faſcia, and as in ſeparating the muſcles we have much of their connections to attend to, it may be well to point out ſuch circumſtances as may illuſtrate the general deſcription of the faſcia.

In carrying an inciſion through the faſcia above the tract of the femoral artery, and diſſecting back that portion which covers the outſide of the thigh, the direction of the fibres on the outer and on the inner ſurfaces of the faſcia will be found very different, ſhewing the two plates of which it is compoſed. Upon the outer ſurface its fibres run in circles round the thigh; upon the inſide they run in the length, and are more ſilvery and cloſer.

Upon the inſide of the thigh, beſides the coat of cellular membrane which involves the veins, there is a more appropriated ſheath, though by no means like the faſcia on the outſide of the thigh in ſtrength. Upon diſſecting this part of the faſcia from the more ſlender muſcles which come down from the os pubis, it will be found to ſend down interlacing fibres betwixt the muſcles, keeping them in ſome meaſure diſtinct from each other. Of this we have an example in the gracilis muſcle; for when we ſlit up and diſſect back the faſcia which covers it, we ſtill find a condenſed membrane ſeparating it from the triceps.

The femoral artery, as it deſcends from the groin, gets betwixt the tendinous inſertion of the triceps and the origin of the vaſtus internus muſcles. Betwixt theſe two muſcles there is ſuch an interlacing of tendinous filaments, that they form the bottom of a deep groove in which the artery runs.

The great accompanying vein keeps on the inſide of the artery, and turns more and more under the artery as it deſcends to paſs through the triceps muſcle. The vein is very ſtrong in its coats; and perhaps in an operation it might be miſtaken for the artery, if the ſurgeon ſhould be left to judge by the feeling betwixt his fingers, which in many caſes is a good criterion.

NOTE OF THE NERVES WHICH ARE TO BE TRACED AMONG THE MUSCLES ON THE FORE PART OF THE THIGH.

Of the trunk of the anterior crural nerve.—This nerve commences by a twig from the ſecond lumbar nerve. The third is almoſt entirely expended upon it. It receives likewiſe a twig from the fourth. The body of the nerve lies betwixt the pſoas and iliacus internus muſcle. It comes from under the ligament of the thigh, by the outſide of the femoral artery, and is in part covered by the veſſel. As it lies betwixt the muſcles, it ſplits into numerous branches, which tend downward upon the thigh. It here receives twigs from the lumbar nerves; and it ſends delicate branches to the internal iliac muſcle, and to the pſoas muſcle, viz. recurrentes nervi pſoæ.

Of the diſtribution of the anterior crural nerve.—A very minute knowledge of the muſcular branches will add little to our practical knowledge. In diſſection, when we find a branch of this nerve going to a muſcle, we know its origin and diſtribution, and conſequently its name. Thus, three branches to the ſartorius muſcle:

Nervus muſculi ſartorii brevis vel ſuperior,
——————— medius,
——————— longus vel inferior.

In the ſame manner the three nerves of the vaſtus externus: Nervi lividi, or pectenalis, going down upon the pectenalis; nervus muſculi cruralis; nervus muſculi recti, &c.

Obturator nerve.—Origin commences with a twig from the ſecond lumbar nerve. As it paſſes the third lumbar nerve, it is joined by ſome delicate twigs. It has alſo additional twigs from the fourth lumbar nerve. It comes out from the pelvis by the thyroid hole, conſequently in the middle of the muſcular fleſh of the thigh, and is chiefly diſtributed to the adductor muſcles. In oppoſition to the laſt mentioned nerve, it is ſometimes called the poſterior crural nerve.

EXPLANATION OF PLATE XV.

A, The tendon of the external oblique muſcle of the abdomen, where it forms the ligament of the thigh *.

B, The spermatic chord. The direction of the chord and of the epigaſtric artery behind the ligament are marked by dotted lines, ſhewing the danger in which they ſtand in the operation for the femoral hernia.

C, The sartorius muscle ariſes from the upper ſpinous proceſs of the os ilium, and takes a courſe ob-

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* The origin of the epigaſtric artery from the femoral artery is not ſo diſtinctly ſeen as here repreſented, unleſs the ligament be diſſected up a little.

Plate XV

C.Bell delt.

Heugo Sc.

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liquely down the thigh, and round the inſide of the vaſtus internus muſcle. It is here a little turned from its ſeat, to ſhew the whole courſe of the artery, and the muſcular twigs which it receives.

D, The RECTUS MUSCLE.

E, The VASTUS INTERNUS MUSCLE.

F, The VASTUS EXTERNUS MUSCLE.

G, The FASCIA LATA, diſſected from the great muſcles of the thigh, and held back.

H, The PATELLA.

I, The GRACILIS MUSCLE.

K, The SEMI-MEMBRANOSUS MUSCLE.

L, The ILIACUS INTERNUS and PSOAS muſcles, ſinking down to reach the trochanter minor.

M, The PECTENALIS MUSCLE.

N, TRICEPS MAGNUS.

ARTERIES AND NERVES.

1. The FEMORAL ARTERY, coming from under Paupart's ligament.

2. The EPIGASTRIC ARTERY, turning up behind the tendon of the abdominal muſcles. Its courſe is marked by dotted lines.

3. The CIRCUMFLEX ARTERY OF THE ILIUM. It takes its courſe upon the ſpine of the os ilium, and inoſculates with the lower lumbar artery.

4. A ſuperficial branch; conſtant in its diſtribution to the origin of the ſartorius muſcle, the ſkin and inguinal glands.

5. The INTERNAL CIRCUMFLEX ARTERY. It is ſeen to paſs down, to go round the head of the thigh bone. It ſends branches inwards to the membrane filling up the thyroid hole; ſends muſcular branches down the top of the thigh upon the back part; and continues its courſe, gradually diminiſhing in importance till it reaches the capſular ligament. It ſupplies the ſynovial gland in the bottom of the acetabulum. It is generally a branch of the profunda, ſpringing immediately from its root.

6. A branch from the internal circumflex artery, more commonly derived from the main artery (vide Haller's Tab. I. *m*), which gives off the upper external pudic.

7. The INFERIOR EXTERNAL PUDIC. The pudicæ externæ are irregularly diſtributed to the external parts of generation, and the integuments upon the inſide of the thigh.

8. A cutaneous branch from the femoral artery.

9. The ARTERIA PROFUNDA, the great muſcular artery.

10. The EXTERNAL CIRCUMFLEX ARTERY. It runs under the head of the rectus muſcle; turns round the great trochanter; and is extenſively diſtributed to the back part of the joint. It ſends down extenſive muſcular branches; and twigs, derived from this branch, emerge from the muſcles upon the outſide of the thigh, even near the knee.

11. From this great branch of the profunda is ſent off the great PERFORATING ARTERIES.

12. The TRUNK of the femoral artery continued, after giving off the profunda. In all this tract, till the artery paſſes the triceps magnus, it gives only ſmall twigs to the muſcles. It lies here betwixt the origin of the vaſtus internus, and the inſertion of the triceps muſcles.

13. A cutaneous branch.

14. Branches to the rectus and vaſtus externus muſcles.

15. Branches to the ſartorius muſcle.

16. The GREAT FEMORAL VEIN. It gets more behind the artery as it deſcends. They are ſeen ſinking behind the tendinous fibres, ſent from the triceps to the vaſtus internus.

17. The perforating branch of the popliteal artery. Another perforating branch will be ſeen in the view given of the back of the thigh.

18. This branch perforates the triceps to get into the ham, and runs down (ſuperficially) betwixt the hamſtring tendons, in union with the iſchiatic nerve.

19. ARTICULAR ARTERIES, branches of the popliteal artery.

20. The ANTERIOR CRURAL NERVE.

21. Branches of this nerve to the ſartorius muſcle.

N. B. From a branch of the anterior crural nerve, going to the vaſtus internus, is ſent off the NERVUS SAPHENUS, or CUTANEUS LONGUS. This nerve runs down under the ſartorius; is joined by ſome minute twigs from the deeper muſcular branches of the obturator nerve. Continuing its courſe, it appears as a cutaneous nerve upon the inſide of the knee. From this proceeding downwards, it is largely diſtributed over the tibia; is intricated with the ſaphena vein; and, finally, ends on the inner ankle and fore part of the foot and toes.

OF THE ACCIDENTS AND DISEASES OF THE ARTERIES IN THE THIGH, AND OF THE POPLITEAL ANEURISM.

THE view of the femoral artery given in Plate XIV. fig. 1. (where it is ſeen lying imbedded in the groin, and where the relative ſituation of the moſt important parts, and the appearance of the cellular membrane, are ſhewn) points out to the ſtudent the neceſſity of paying attention to theſe parts in the diſſection; for this alone can give him the knowledge which will enable him to recogniſe the parts when disfigured by diſeaſe, or in operations on the living body.

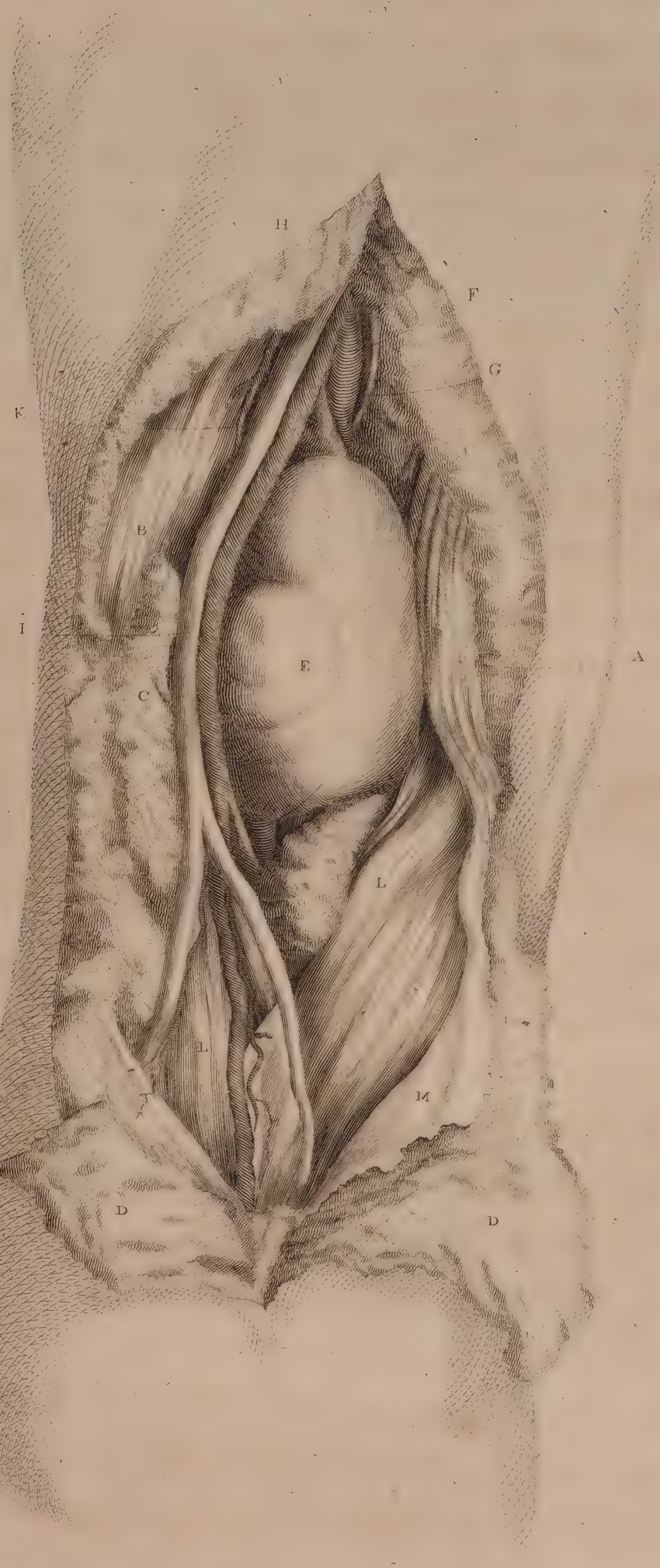
I have had an opportunity of ſeeing every kind of aneuriſm; the operation in ſeveral caſes; but more frequently, and with more improvement, the diſſection. In ſome inſtances, perhaps, the caſes ſtrictly belonged to others. But from ſuch opportunities, I conceive it to be perfectly allowable to draw every poſſible information; although we ſurely ought not to think ourſelves entitled ſo pointedly to detail the caſe as to anticipate the hiſtory of it: and above all, no one is in ſuch circumſtances entitled to give a critique of an operation, or of the practice of an individual; becauſe things eſſential to the caſe, and which may have influenced the practice, may be miſunderſtood. It is, as far as the opinion of the accuſer has any influence, to condemn a man unheard; for accuſations will find their way in the world where the vindication ſhall not reach.

It has been already mentioned, in treating of the diſeaſes of the arteries, how frequent their enlargements are at the flexures of the groin and ham; and the explanation which appeared to be the moſt natural of this circumſtance was there fully detailed (ſee p. 62.) But it is not merely the ſtructure or ſituation of thoſe parts which occaſion the many diſeaſes of theſe arteries; they are beſides expoſed to many accidents.

A wound of the great artery high in the thigh is ſuddenly fatal. If by a ſlighter puncture, or the external wound healing quickly in conſequence of compreſſion, an aneuriſmal tumor ſhould be formed, thoſe connections amongſt the muſcles, which have been carefully pointed out, cannot withſtand the continued impulſe of the blood; but in a ſhort time the blood driving amongſt the muſcles, inſulates them; and upon operation an extenſive irregular cavity is found.

It muſt be a much more difficult operation to tie a wound of the leſſer branches of arteries, than where the trunk is pierced; for if the wound be deep, others are, in ſearching for the wounded artery, unavoidably cut, and even the great trunk endangered; and on enlarging the wound, there is ſuch confuſion of the effuſed coagulated blood in the interſtices of the muſcles, that the artery is with difficulty found, and extenſive inciſions are neceſſary; which, if not very cautiouſly made, increaſe the evil.

In the encyſted aneuriſm the progreſs of the tumor is ſlow. In a caſe of aneuriſm in the groin, to which



Drawn by Charles Bell.

Engraved by J.s Grant.

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I paid particular attention, a ſmall tumor aroſe immediately below the ligament of the thigh. It remained ſtationary a long time; but upon ſome ſlight exertion it ſuddenly enlarged, ſtretching down the thigh. Here its progreſs ſeemed again arreſted for ſome time; but it again increaſed, and ſhowed, by the knobular figure of its ſurface in its laſt ſtage, theſe three ſucceſſive changes which it had undergone. The ſmaller diviſion of the tumor which firſt aroſe, gradually loſt its pulſation; whilſt the beating was very great in the more extenſive tumors further removed from the ligament. When the two hands were extended over the tumor (for its ſize was ſo great), the beating of the collateral arteries was diſtinctly felt on each ſide round the baſe of the tumor. Though the veins of the thigh were much enlarged (the aneuriſm compreſſing them as they go up under Paupart's ligament), the limb was not œdematous, which generally happens in ſuch caſes.

The DISSECTION ſhowed exactly what the preceding views of the anatomy would lead us to expect. Upon the moſt prominent part of the tumor, and where the pulſation had been more diſtinctly felt, the ſkin and faſcia and ſac of the aneuriſm were blended together. Upon the outſide of the thigh, the firm and tendinous aponeuroſis tied down the aneuriſmal ſac. The aneuriſmal ſac was diſtinct, and ſeparated the clots of blood from the ſurrounding parts; but ſtill it was impoſſible to diſtinguiſh whence it was derived. The external iliac artery was much enlarged and oſſified; and alongſt the whole track of the aorta ſeveral enlargements and oſſifications were found.

We cannot be at a loſs to account for the ſucceſſive ſtages of the growth of the tumor, nor for the want of pulſation in that firſt formed. The tumor in the beginning was probably formed by the dilated coats of the artery, and they were ſuſtained by the uniform reſiſtance of the ſurrounding parts; but upon the failure of ſome of the connections of the faſcia, a ſudden dilatation was allowed, and the tumor ſpread irregularly to the weaker points, and down the thigh, in the direction of the original impulſe of the blood. While the dilatation is ſo ſmall, that the blood keeps moving in it, there is probably no coagulum formed; but when it ſtretches into diſtinct ſacs, the ſtream is diverted from the original channel, and the tumor firſt formed fills with firm coagula, and the pulſation is conſequently ſuppreſſed *.

When the operation for aneuriſm is performed in the groin for a caſe like the preſent, it cannot ſucceed; and the practice of the moſt expert ſurgeons ſhows us the confuſion which is likely to follow. Upon the firſt inciſion for laying bare the ſac, ſo many collateral arteries (which we have noticed to be much enlarged), and the veins, too, which are likewiſe enlarged in that direction, in conſequence of the obſtruction and preſſure of the tumor, pour out ſo much blood, that the whole operation is to be done upon parts covered with blood, where the only guide is the feeling †. In regard to the ligature of the great artery, we muſt be under perpetual alarm; and for the ſpace of two weeks we cannot be aſſured that the failure of the ligature, or rather the ulceration of the coats of the artery by the ligature, will not be inſtantly fatal. Or, if the bleeding ſhould for this time be ſtopped by the ſurgeon, the repeated failure of ligatures, and the endeavour to follow up the trunk of the artery below the ligament of the thigh, with the deluge of blood, and faint exertions of a patient dying in your hands, make a terrible ſcene.

In following the crural artery in its important diſtribution, as exhibited in Plate XV. we ſee the utility of a thorough knowledge of the anatomy, and of the relation which the ſartorius bears to the track of the great artery and branches of the profunda; and we muſt be aware how very difficult it is, even with this knowledge, to follow in idea the track of weapons, and judge of the importance of the arteries wounded.

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* See an intereſting paper upon diſeaſed blood-veſſels, by Dr. Baillie, in the *Tranſactions of a Society for the Improvement of Medical and Surgical Knowledge.*

† See an inſtructive caſe in "Surgical and Phyſiological Eſſays, by Mr. John Abernethy," vol. iii. p. 160.

As the artery deſcends, it approaches the bone; and eſpecially as it turns round to go into the ham, it lies very near it, which expoſes it to be punctured by the ſpiculæ of the bone in fractures. As the artery here is much more firmly embraced by the muſcles than in the upper part of the thigh, there is preſented, in ſuch an accident, upon diſſection, a very curious appearance; for the large muſcles, the vaſti, are undermined, and they cover the acquired ſac of the aneuriſm with a layer of fibres, cauſing it to reſemble a ſtrong muſcular bag.

OF THE OPERATION ON THE FORE PART OF THE THIGH FOR THE POPLITEAL ANEURISM.

Particular attention ſhould be paid to the anatomy of the crural artery, as it pierces the triceps muſcle; with a view eſpecially to the high operation for the popliteal aneuriſm. We ſhall by and by conſider the preference which the operation performed at this part holds over the older manner of operating for this kind of aneuriſm. The anatomy, as pointed out in the explanation of Plate XV. will ſhow us what parts we are to attend to in the operation; but it may be neceſſary to point out the means of hitting theſe parts accurately on the living body. We cannot ſtudy ſurgical anatomy by diſſection alone; but by a careful examination and compariſon with the points of the living body, which are to be our guides. Here, for inſtance, the courſe of the ſartorius muſcle is of infinite importance. It is not eaſily brought into ſuch action as will ſhow its courſe on the limb; but if a weight be placed upon the ground, and we attempt to ſhove it ſidewiſe with the ball of the great toe, it will be brought to ſwell and ſhow its courſe. The inciſion is to be made upon the outer margin of the muſcle, beginning a little below the middle of the thigh, and following the curve of the muſcle. In purſuing this firſt inciſion under the ſartorius (its upper ſurface being kept in adheſion with the integuments), and betwixt the origin of the vaſtus internus and the inſertion of the adductor magnus into the thigh bone, we find the artery covered by irregular fibres of the faſcia. There appears to be no foreſight nor method of operating which can enſure ſucceſs in this operation, except by guarding againſt too large an inciſion; by the accuracy with which it is made to correſpond with the point of the artery to be tied; and by taking care that, in uncovering the artery, the parts are not too much looſened, eſpecially the ſartorius muſcle; and by cutting the artery betwixt the two ligatures, and allowing it to contract and bury itſelf amongſt the cellular membrane. When the wound is extenſive (and it is perhaps impoſſible to avoid it in a big and fat man), a large ſuppurating ſore is the conſequence; and there will be a greater chance of the ſinuſes forming up along the ſide of the artery, which ſometimes takes place even in the moſt dexterous operation. The conſequence of this ſtate of the artery is, that inſtead of being ſupported by the ſurrounding parts, it lies ſurrounded with matter; the ligatures, like ſetons, keep up the diſcharge; and the veſſel ulcerating, the patient dies by the loſs of blood, if not by one guſh, at leaſt by ſucceſſive ſmaller bleedings. Another circumſtance with regard to the ſartorius muſcle is, that when it is left looſe in the wound, it ſwells and fills up the opening, ſo that the matter is confined.

OF THE ANATOMY OF THE HAM, AND OF THE ANEURISM AT THIS PLACE.

As the anatomy of the ham, and the diſeaſe of the artery, have ſo ſtrict a connection with the ſubject of which we have now been treating, it will be better to finiſh the conſideration of them here, than to leave it for ſeparate explanation after the diſſection of the hip and back part of the thigh.

Upon laying aſide the true ſkin and ſuperficial cellular membrane from the back part of the knee-joint, we have firſt to obſerve, as of the utmoſt importance in the diſeaſes and operations, the ſtrong faſcia which covers the muſcles and great veſſels and nerves. We find a ſtrong layer of fibres coming down obliquely from the outſide, derived from the faſcia lata of the thigh. From the projecting head of the fibula there runs upwards a layer of ſilvery fibres croſſing the firſt. From the tendon of the membranoſus muſcle an aponeuroſis comes down, which, gaining additional fibres as it deſcends, forms a very ſtrong ſheath, covering all the back part of the leg. In other words, betwixt the two condyles of the thigh bone, and from the head of the fibula and betwixt the ham-ſtring tendons, a ſtrong faſcia of interwoven fibres is extended, and this is prolonged down upon the origin of the gaſtrocnemii muſcles and back of the leg.

Upon ſlitting up and diſſecting back the faſcia, the great nerve appears. It comes down betwixt the biceps and membranoſus muſcles, on a level with the top of the trochanter. It ſplits into two great branches: the greater continues its courſe betwixt the heads of the gaſtrocnemii muſcles; whilſt the leſſer goes outwardly and obliquely downwards ſuperficially (but under the faſcia). Splitting into branches, there goes off from the leſſer branch, directly in a middle courſe betwixt the gaſtrocnemii muſcles and faſcia, a ſmall nerve, which is accompanied by a conſiderable vein. But theſe will be more minutely detailed in the ſucceeding part of the work.

Below the nerve, and the ſuperficial vein and long ſlender artery which accompanies it, there is much cellular membrane and fat. Under this fat, and cloſe to the bone, lie the popliteal artery and vein. They are imbedded in this tiſſue, and are intimately connected together; the vein more outwardly in its uninjected ſtate clinging round the artery, and the leſſer branches of veins ſtriding over it.

If the parts be accurately retained in their natural ſituation during diſſection, it will be ſeen, that in order to find the eaſieſt acceſs to the artery in operation, our inciſion ſhould be made rather towards the outer hamſtring than immediately in the middle. By this means we keep to the outſide of the iſchiatic nerve. We ſhall find the artery lying deep and covered with the vein; and to tie it ſeparately, it muſt be diſentangled from under the vein. But let us conſider the ſtate of the parts in diſeaſe.

STATE OF THE PARTS IN POPLITEAL ANEURISM.—The limb is generally œdematous; ſometimes ſo much ſo as to make the pulſe at the inner ankle to be felt with difficulty, independently of its faintneſs from the aneuriſm. The limb is in general conſiderably bent. Round the whole knee-joint there is much ſwelling; ſo that the tumor in the ham is not very diſtinct, but has more the feeling of general tenſion.

Upon laying open the integuments, the tumor comes more diſtinctly into view, diſtending the faſcia.

With regard to the appearance and ſituation of the parts, particularly of the nerve, and great vein, and leſſer ſaphena, it muſt depend upon the direction in which the coats of the artery firſt give way. If, as in the annexed Plate, the artery ſhall have given way towards the inſide, then the tumor will increaſe in that direction chiefly; while the artery itſelf will, in ſome degree, be puſhed in the oppoſite direction, and the nerve and the vein will be crowded towards the outer hamſtrings.

For the ſame reaſon, when the tumor, while yet ſmall, has got to the outer ſide of the veſſels, as it enlarges it puſhes them towards the inſide; or the nerve may even be carried directly forward upon the tumor. The natural anatomy, therefore, can only teach us the appearance of the parts, enabling us quickly to recognize them; but we can never *à priori* know their ſituation in this diſeaſe. In viewing Plate XVI. we ſhould immediately determine, that the tumor could not originate from the coats of the artery, nor be an extenſion of them, ſince the tumor is ſo abrupt and circumſcribed, and the artery immediately above partakes ſo little of the enlargement. It is only by obſerving the progreſs of

ſimilar tumors in the breaſt and belly, that we are convinced of the great dilatation which membranes will allow. They acquire ſo gradually additional ſtrength and increaſe of thickneſs, that unleſs we were in a manner witneſs of the gradual change in the nature and properties of the arterial coats, we could not doubt that theſe tumors were formed by the cellular membrane gradually condenſing, in conſequence of inflammation and the impulſe of the blood.

The popliteal aneuriſm takes place exactly in that part of the artery which muſt accommodate itſelf to the flexure of the joint. It would appear, however, that ſometimes it occurs lower, in conſequence of ſome violent action of the heads of the gaſtrocnemii muſcles, or where the arteries of the leg are given off. The oſtenſible reaſon for the new method of operating, viz. on the fore part of the thigh, is, that the artery may be ſuppoſed to partake more of the diſeaſe, in proportion to its proximity to the tumor. But this is putting the merit of the operation upon an inſecure footing; for we know that the diſeaſed ſtate of the arterial ſyſtem is always greater towards the trunks, and that it is gradually encroaching upon the extremities; that the diſeaſe is common to all the ſyſtem, though the peculiar ſituation of the artery ſubjects it to additional riſks. Theſe may even be increaſed by the circumſtances of a patient's general habits or way of life; but eſpecially this diſeaſe is frequent in ſuch as keep the joint habitually bent, but are liable to occaſional violent efforts of the limb, and chiefly of the gaſtrocnemii muſcles. It was formerly obſerved, that horſemen were more eſpecially expoſed to it; and that claſs of men ſtill continue to be the great ſufferers by this diſeaſe. Whatever may be our reaſoning upon this fact (ſee p. 62.), it is evidently to be attributed to ſome cauſe which affects the portion of the artery which is ſubject to the flexion of the joint only; and if the ligature can be as eaſily and effectually ſecured three inches above the joint as upon the fore part of the thigh, it will be as effectually removed from thoſe cauſes of failure of the artery which are peculiar to the joint, and there will be leſs chance of the general affection of the trunks having reached ſo far. The better reaſons for preferring the new operation ſeem to be, the difficulty of operating in the ham; the depth at which the artery lies; and conſequently the difficulty of drawing the ligature accurately: and when the operation ſucceeds, a permanent contraction of the limb is apt to remain, probably ariſing from the great nerve being ſo much expoſed in the operation, that it muſt partake of the inflammation, and remain in the midſt of the parts condenſed and hardened in conſequence of it. The power, or conveniency rather, which the higher operation gives of tying the artery again and again, following it up the thigh as the ligature ſucceſſively gives way, is but a forlorn hope. This is not the merit of the operation. It is, that it allows us at once with a ſmall inciſion to tie the artery; and when firmly ſecured with ligatures in the extremities of the inciſion, to cut in the middle portion, which allows the ends to ſhrink, and bring themſelves amongſt the cellular membrane, without interfering with the diſeaſed and diſordered parts.

EXPLANATION OF PLATE XVI.

In this inſtance, the operation above the triceps muſcle proved unſucceſsful; the limb gangrened, from the ligature cutting the veſſel, and the attempt to ſecure it with the tourniquet!!

A, The INNER HAMSTRING muſcles.

B, The OUTER HAMSTRING muſcles.

C, Fat left undiſſected. A maſs of fat is ſeen filling up the ſpace betwixt the origins of the gaſtrocnemii.

D, The INTEGUMENTS fallen down over the back of the leg.

E, The ANEURISMAL TUMOR.

F, The artery above the tumor, lying deep and near the bone.

G, A leſſer vein, ſtretching over the artery to accompany ſome of the articular arteries.

H, The GREAT POPLITEAL VEIN, ſeparated from the artery by the enlargement of the tumor. When this vein is much compreſſed, the leſſer ſaphena vein is proportionally enlarged.

I, The ISCHIATIC NERVE.

K, A branch of the FEMORAL ARTERY, above the triceps, accompanying the nerve in its courſe.

L L, The ORIGINS of the gaſtrocnemii muſcles.

M, The FASCIA diſſected back.

OF THE CHANGES WHICH TAKE PLACE IN THE CAPACITY AND ACTION OF ARTERIES WHEN TIED, AND THE CIRCUMSTANCES WHICH INFLUENCE THESE CHANGES.

As morbid anatomy, or the changes which diſeaſe occaſions, and the effect of operations upon the neighbouring parts, deſerve ſo much of our attention; and as the laws by which the arteries in theſe caſes are influenced, prove ſo uſeful and curious an inquiry, and ſo neceſſary to be remembered in determining upon every operation, I ſhall here endeavour to lay before the reader a few of the more important circumſtances which influence the arteries.

What I now moſt anxiouſly wiſh to explain is, the connections and ſympathies of the trunks of veſſels ſupplying a limb, with the changes in the limb or part of the body which they ſupply. When part of a limb is amputated, the trunks of the arteries which ſupplied it rapidly diminiſh in ſize, and contract their diameter. If the lower part of a limb mortify, and the diſeaſe gradually encroach upon the limb, and ſpread upwards, the activity of the arteries is found proportionally decreaſing, and their diameter ſhrinking; inſomuch, that if it be thought fit to amputate the limb above the diſeaſed part, the ſize of the arteries will be found diminiſhed, and the bleeding conſequently leſs. In theſe circumſtances, the leg has been amputated without the neceſſity of tying the arteries on the ſtump *; and, upon diſſection, it is found that the arteries in mortified parts are ſtopped with coagulated blood.

In contraſt with this, we have to contemplate the changes to which the arteries are ſubject in the natural growth of the body, or when an adventitious tumor grows upon a limb. As a limb enlarges in the courſe of nature, the arteries ſupplying it increaſe in ſize and ſtrength. No one in theſe days will ſay, that this is merely a dilatation of the artery; on the contrary, it is an increaſe of ſize, ſtrength of coats, and energy of action. In the caſe of an adventitious tumor growing upon a member, we find the arteries of that member gaining ſtrength and increaſe of capacity, and enlarging their diameter, and becoming more tortuous proportionally as the tumor increaſes in ſize. In reaſoning upon theſe facts, Dr. Hunter writes thus *: "Every body muſt ſee, that in this caſe the trunk of the artery would dilate till it became proportionable "in capacity to its branches; for till then the trunk would be the narroweſt part of the canal, the part "where there would be the moſt reſiſtance; and therefore the yielding coats of the artery would give way "till the juſt proportion was eſtabliſhed between the trunk and all its branches." This explanation proceeds upon a falſe principle; for although the trunk of the artery may be ſuppoſed proportionably narrower than the branches, yet as it is not narrower now than formerly, why ſhould it give more reſiſtance than formerly? Should not the greater diameter of the extremities rather lead to the inference, that ſince the reſiſtance to the paſſing forward of the blood is diminiſhed, the force of the blood laterally upon the trunk of the veſſel is likewiſe diminiſhed? But this is not the way in which the difficulty is to be ſolved: It is evident that an increaſe of blood is ſent to the limb; and the queſtion is, How is this beſtowed? It is obſervable by every one in any degree converſant with the trifling accidents and local diſeaſes of the

* See Medical Obſervations, Vol. II.

body, that where there is an injury, an inflammation, a ſwelling, whether inflammatory or indolent, there is, according to the importance of the tumor, a ſtrict connection and ſympathy betwixt the diſeaſed part, and the veſſels more or leſs remote by which it is ſupplied. Where there is a ſmart inflammation, there is a very perceptible increaſe of action quickly ceaſing with its cauſe. Where there is an indolent tumor, there is a more imperceptible, but permanent, change in the ſize and activity of the veſſels. In this view, I hope, it will appear that the explanation, which reſts merely upon the diſtention and dilatation of the arteries by the blood, is but lame and imperfect; and that it will be evident, that in the veſſels of a limb, when influenced by a great tumor growing upon it, the ſame change takes place as under the influence of the natural growth of the limb from childhood.

Let us take the queſtion in another light. Let us trace the obſervations of Dr. Hunter to the phenomena which gave riſe to his moſt ingenious reflections, viz. the caſe of varicoſe aneuriſm, in the ſecond volume of the Medical Obſervations.

In that ſpecies of aneuriſm in which a communication betwixt the artery and vein is formed in the bend of the arm, and by which a proportion of the blood which ſhould circulate in the arm is drawn aſide from the trunk of the artery into the baſilic vein, and finds a leſs circuitous route back to the heart, it ſeems invariably to happen that the brachial artery is enlarged from the axilla down the arm to the communication. It becomes larger, and more tortuous, and its pulſation is more diſtinctly felt. This increaſe of diameter and ſtrength, Dr. Hunter aſcribes to the derivation of blood by the aperture, and reaſons upon it in the words already quoted; conceiving this derivation of blood to act in a manner analogous to the adventitious tumor growing upon the limb. Did the motion of the blood in the arteries depend upon the laws of hydraulics ſimply—this breach in the veſſel, this leſs circuitous route back to the heart, giving an eaſier circulation than through the extreme veſſels, the ſupply of blood to the fore-arm would be permanently diminiſhed. But the laws of the economy have directly a different tendency: for as the natural growth of a limb has an immediate effect (by what ſympathies, or mode of action, we muſt remain ignorant), in enlarging the parent trunk, ſoliciting a greater action and ſupply of blood; and as, after the natural increaſe of the limb is arreſted, a preternatural tumor growing upon the member will ſtill farther increaſe the agency of the veſſels, it is natural to infer, from ſuch ſtrong analogy, that it is the influence of the fore-arm which occaſions the increaſe of ſtrength in the brachial artery; that the breach in the artery has withdrawn a quantity of blood from the arm, which is ſupplied by a more vigorous action in the trunk of the artery.

Of the collateral arteries in aneurism.—But it is only from a more extenſive view of the changes which take place in arteries, that we can form a decided opinion reſpecting the circumſtances which affect them. We ſhould naturally conceive, upon a ſuperficial view, that when the trunk of an artery is tied, the collateral arteries enlarge merely as a conſequence of the greater impulſe of blood into them. But it is evident, that it is not the impinging of the blood upon their coats which diſtend them; ſince, when their extremities are tied, as after amputation, they do not dilate: and from an examination of the collateral arteries in aneuriſm, we ſee, that there is not a dilatation or extenſion of the coats merely, but at the ſame time an increaſe of ſtrength and thickneſs of the coats, as in the natural growth of the arteries. We have to ſhow how the arteries become tortuous, alſo, as they increaſe in power; and we hope to ſhow, that this tortuous figure of the artery is the great means of the additional exertion.

In Dr. Hunter's remarks upon the caſe already quoted, there are ſeveral inſtances of the ſerpentine courſe which arteries take, as illuſtrating the increaſe and convolutions of the artery of the arm in aneuriſmal varix. This change he ſuppoſes to happen, "becauſe the artery is lengthened, and therefore cannot preſerve its courſe;" and that it is lengthened by the diſtenſion of the blood. Mr. John Bell, in his

Anatomy of the Heart and Arteries, has objected to the reaſoning of Dr. Hunter, but has come nearly to the ſame concluſion. " It is merely (ſays he) a conſequence of the long continued preſſure " of the blood: it is this only which can account for the ſlowly increaſing tortuoſity in the temples " or hands of an old man, or the ſudden tortuoſity which the newly dilated artery aſſumes after the " operation for aneuriſm." (P. 291.) When the functions of an artery are conſidered, this matter will appear in a different light. As the artery poſſeſſes a power of accelerating the blood, or of circulating it by an action alternating with the heart, the force exerted by an artery upon the blood muſt be in proportion to the length of the artery. A portion of an artery, of the length of three inches, will have a greater power of accelerating the blood than one of two inches, though they are equal in diameter; there being in the one a greater latitude of action than in the other. The combination of the muſcular reaction of the firſt artery, exerted to accelerate the blood, will, when compared with that of the other, be as three to two. It follows, therefore, that the increaſed length of an artery, which has aſſumed the ſerpentine zig-zag courſe which arteries take in the ſeveral inſtances already mentioned, as in the temporal arteries when a great tumor grows upon the head, in the collateral arteries in aneuriſm, and in the brachial artery in the aneuriſmal varix, is a means of additional force and power to the circulation. It ſeems to depend upon the ſame principle, and to be conſonant with the ſame laws, which influence the increaſe of the artery in diameter and in muſcular ſtrength. That part of the member which remains beyond the ligature of the artery in the operation for aneuriſm, comes to act upon the collateral branches in a manner ſtrictly analogous to the way in which a great tumor growing upon a limb, or upon the head, acts upon the arteries of the part. The arteries become enlarged and tortuous, with an increaſe of pulſation and force; or the limb acts upon its collateral arteries as its growth did upon the trunk, there being ſuch an effect mutually exiſting betwixt the increaſe of the member in bulk, and the capacity and energy of the arteries which ſupply it. The ſerpentine form of the arteries in old age is the natural courſe of the economy acting in a uniform tenor from childhood. It is a mark of the gradual failure of the activity of the arteries; and at the ſame time a temporary relief from that failure, and a means of ſupporting the action of the ſyſtem.

The increaſe of the collateral arteries after the operation for aneuriſm, which from experience we know to be the harbinger of a ſucceſsful termination, and of the cloſing of the trunk, is to be accounted for upon the ſame principle. It ſhows a degree of youthful pliancy in the branches; it proves that the influence of the limb has ſucceeded; that the current of blood has changed; and that the trunk of the artery is left dormant to take thoſe changes, which are completely to preclude the flow of blood. (See Part Second, under the title, Of the State of the Veſſels in Abſceſs.)

The numerous melancholy inſtances of the death of patients from the operation of aneuriſm, teach us the importance of attention to the ſtate of the ſyſtem in determining upon the operation. If the patient be young, and the aneuriſm have been produced by an accident, as a violent ſtrain and twiſting of the knee-joint, the ſpiculæ of a fractured bone, puncturing of the artery, &c. to tie the artery, even by an operation apparently bold or fool-hardy, will be attended with ſucceſs; and ſo all experiments upon animals will be. But we muſt not be miſled to conceive that, without regard to circumſtances, an operation, if done after a certain manner, and with ſuch and ſuch ſtages, ſhall be univerſally ſucceſsful. It is to the ſtate of the patient that we are chiefly to look. A man far advanced in life, with a diſeaſed ſtate of the arteries, will fall a ſacrifice, however dexterouſly the operation may be performed. The collateral arteries will not be in a ſtate to take an increaſed action, and to enlarge, ſo as to give a new route to the blood, and make a complete derivation from the trunk, which is tied. But the blood making an effort to keep in the old channel, will retain the artery unſealed by the coagula, which ſhould form in it; and in a few days the ligature cutting its way out by the ulceration of the artery, there will be a profuſe bleeding.

It may be uſeful to obſerve the conſequences of amputation to ſuch a patient, and the changes which we know to take place. After amputation, there is a diminiſhed energy of action in the whole remaining arteries of the limb, and a real permanent contraction of the trunk of the artery and of the ſmaller branches, the extremities of which were diſtributed to the amputated parts. When we conſider that, in general, in aneuriſm the arteries are in a diſeaſed ſtate, and that their partial failure is to be taken as a proof of this, is not the diminution of the diameter of the artery, and of the velocity of the blood, the moſt likely way to ſecure the remaining part of the artery from the farther effects of diſeaſe? Is it not moſt likely that, by allowing it a more quiet ſtate, this may ſecure the patient from the formation of ſucceſſive aneuriſmal tumors in the arteries connected with that limb? Thus differently do facts prove the caſe to ſtand from what a ſuperficial obſervation would lead us to infer. We ſhould conceive, that the amputation of a limb would endanger the remaining ſtump by the greater impulſe communicated to the obſtructed extremities.

In offering theſe remarks, I mean only to illuſtrate the laws of the animal economy in theſe diſeaſes; not to draw unwarily a practical concluſion: for in determining upon the propriety of amputation, there are circumſtances to be attended to which do not fall under our conſideration; and particular attention muſt be paid to what has been obſerved as the conſequence of amputation to a ſyſtem unreduced by previous diſeaſe.

DIRECTIONS FOR THE BINDER.

Printed by MUNDELL & SON,
Royal Bank Cloſe, Edinburgh.

A

SYSTEM

OF

DISSECTIONS.

PART V.

CONTAINING

DISSECTIONS OF THE BACK PART OF THE THIGH, AND OF THE LEG AND FOOT.

WITH PLATES.

SECOND EDITION.

BY CHARLES BELL, SURGEON.

EDINBURGH:

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1800.

SYSTEM

OF

DISSECTIONS.

DISSECTION

OF THE

ISCHIATIC AND POSTERIOR ILIAC ARTERIES, AND PARTS ABOUT THE HIP-JOINT.

THE glutei muſcles are groſs and flabby; and ſo much cellular ſubſtance and fat is entangled with their coarſe fibres, that it is difficult to make a neat diſſection of them. But this is a very important diſſection; it is much connected with that of the perineum; and both parts are much expoſed in falls, to dangerous bruiſes; and to deep wounds, from ſitting unwarily down upon ſharp points; fiſtulous ſinuſes too, ſometimes take their courſe amongſt the cellular membrane, and ligamentous parts here.

When the ſkin and fat are diſſected from the great gluteus muſcle, and when this muſcle is lifted from its origin, and left hanging by its tendon, a great branch of the gluteal artery is ſeen to emerge from betwixt the gluteus medius and pyriformis muſcles; one diviſion of this artery extends round upon the ilium, and ſends twigs backwards upon the ſacrum, while another lies betwixt the gluteus maximus, and the gluteus medius.

The third branch of the gluteal artery is to be followed under the gluteus medius. Without raiſing this muſcle, but by undermining it, holding it aſide, and expoſing the GLUTEUS MINIMUS, we ſee the whole courſe of the gluteal artery, and can underſtand the effect of punctured wounds at this place; and how the aneuriſmal blood forces up theſe muſcles from the os ilium, deſtroys the cellular membrane, and diſtends the coarſe fibres of the muſcles into the ſac of the aneuriſm. We underſtand alſo, how the puncture of the gluteal artery forms an aneuriſmal tumor, ſo large, and ſo covered with theſe glutei muſcles, that the pulſation is not communicated to it, and the ſurgeon takes it for a common abſceſs, and puſhes his lancet into it.

The ARTERIA ISCHIADICA comes out from under the pyriformis, whilſt the gluteal artery appears on its upper edge. The iſchiatic artery and the great nerve come out together betwixt the pyriformis muſcle, and the ſacro-iſchiatic ligament. This artery lying upon the back part of the hip, is under the gluteus maximus; it ſends its branches round towards the anus, to the perineum, to the upper part of the thigh, and inoſculates with the internal circumflex artery.

For continuing the diſſection down the thigh, there is no further knowledge neceſſary than what may be ſufficiently acquired from the plate; unleſs perhaps a ſlight note of the cutaneous branches of the iſchiatic nerve be required.

CUTANEOUS BRANCHES OF THE ISCHIATIC NERVE, IN THE BACK PART OF THE THIGH AND HAM.

Nervus cutaneus posterior et superior is the firſt branch of the great nerve, before it has eſcaped from the pelvis; having run parallel with the great nerve for ſome way, it takes an additional ſlip from it. It divides itſelf into four branches. The first coming out from under the gluteus muſcle, holds its courſe inwards to the ſcrotum and inſide of the thigh: The second branch having divided, pierces the faſcia, and is loſt upon the faſcia and ſkin: The third branch follows nearly the ſame track, but extends further down the outſide of the thigh: And the fourth runs down the middle and back part of the thigh reaching to the ham; it appears firſt by the inſide of the great head of the biceps muſcle.

Nervus cutaneus internus superior.—This nerve riſes in common with a branch going to the long head of the biceps muſcle; after which it proceeds ſuperficially down the inſide of the thigh.

Nervus cutaneus internus inferior is diſtributed to the inſide of the thigh and knee. This branch comes off from the iſchiatic nerve, after it has paſſed the quadratus femoris muſcle; and, nearly in the ſame place, is given off a muscular branch to the quadratus femoris.

Nearly about the middle of the thigh bone, there goes off outwardly a very conſiderable branch, which is diſtributed entirely to the muſcles, to the adductor magnus, ſemi-membranoſus, ſemi-tendinoſus, and biceps.

Nervus cutaneus externus.—This branch appears ſuperficially above the faſcia, on the outſide of the knee, and takes its courſe upon the outſide of the leg. Higher upon the outſide of the thigh, the cutaneous nerves are derived from thoſe coming out upon the groin.

EXPLANATION OF PLATE XVII.

This plate is taken from Haller; becauſe, after a good injection and careful diſſection, the parts will come very much into this form—I diſregard the letter-preſs of Haller; but mark, as I have hitherto done, the leading points in the anatomy and manner of diſſecting.

PROMINENT POINTS OF BONE AND MUSCLES.

A, The dorſum of the ilium.

B, The os ſacrum.

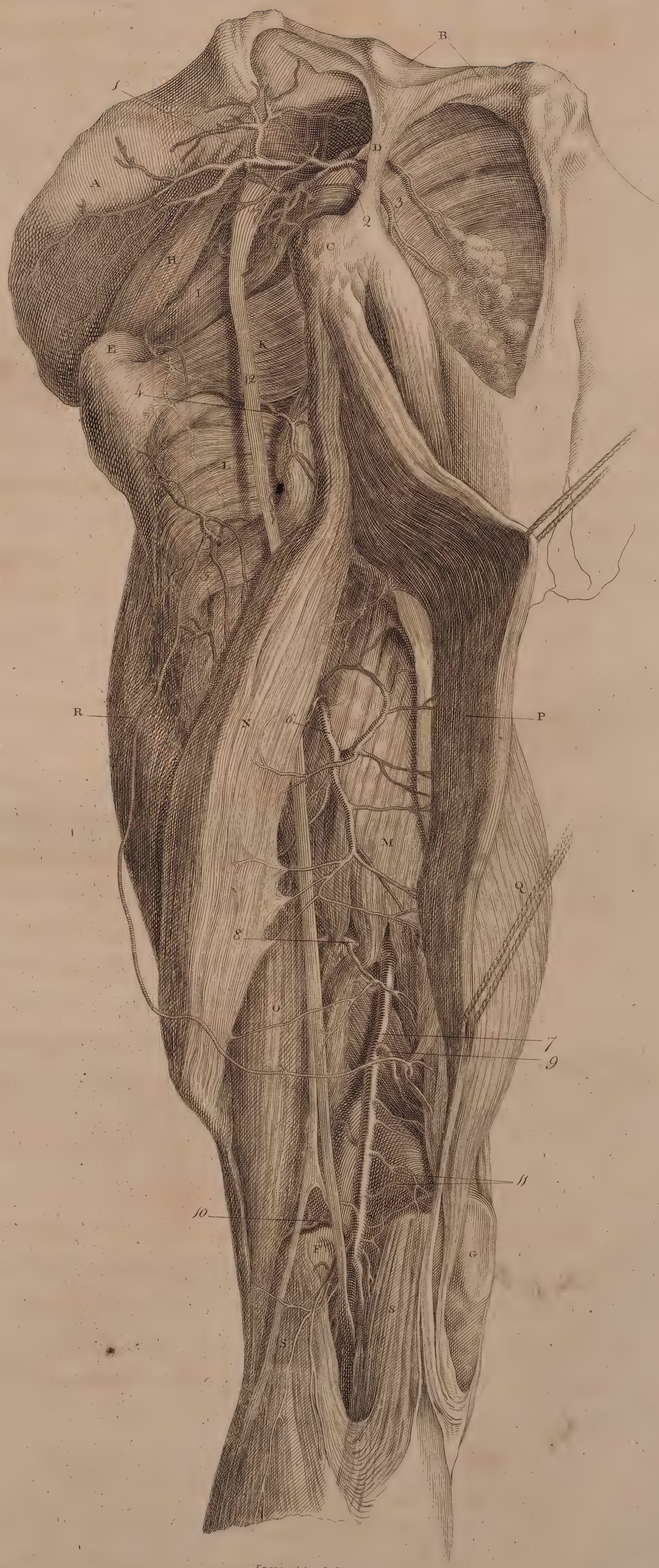
C, The tuberoſity of the iſchium.

D, The ſacro-iſchiatic ligament.

E, Trochanter major.

F, The internal condyle of the thigh bone; G, the external condyle.

Plate XVII.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H, The PYRIFORMIS muſcle; which, ariſing from the hollow of the os ſacrum within the pelvis, is inſerted into the root of the trochanter major.

I, The GEMINI and OBTURATOR INTERNUS. Theſe muſcles are very poorly expreſſed here: But in the diſſection, the ſtrong and well formed tendon of the obturator will be obſerved coming out betwixt the ligaments, from its extenſive origin from the membranes of the thyroid hole; and on each ſide of this, the gemini, viz. two fleſhy ſlips, ariſing from the os iſchii, and inſerted into the trochanter major.

K, QUADRATUS FEMORIS; a flat, ſquare muſcle, paſſing from the iſchium to the root of the trochanter.

L, TRICEPS BREVIS croſſing the middle of the thigh, from the ramus of the os pubis to the trochanter and linea aſpera.

M, The TRICEPS MAGNUS; through which the artery is ſeen to paſs.

N, The long head of the BICEPS FLEXOR coming from the iſchium.

O, The ſhort head of the BICEPS riſing from the thigh bone:—the tendon of this muſcle is the outer hamſtring.

P, The SEMI-TENDINOSUS—it is inſerted into the head of the fibula; is ſeen riſing from the tuberoſity of the iſchium;—it adheres for ſome way to the biceps, but parting with it, leaves the back of the knee-joint unprotected;—it is inſerted into the head of the tibia.

Q, The SEMI-MEMBRANOSUS having nearly the ſame origin and inſertion with the laſt muſcle, theſe two form properly the inner hamſtring tendons.

R, The VASTUS EXTERNUS MUSCLE.

S, S, The heads of the GASTROCNEMIUS MUSCLE.

ARTERIES AND NERVES.

1, The GLUTEAL OR POSTERIOR ILIAC ARTERY.

2, The PUDIC ARTERY, which ſeems to have been here in common with the iſchiadic.

3, The artery to the penis; which is ſeen to give arteries to the levator ani, and perineum.

4, The extreme muſcular branches of the internal circumflex artery, (5, Plate XV). It inoſculates with the iſchiatica.

PERFORATING ARTERIES OF THE PROFUNDA FEMORIS.—Theſe are ſuch branches of the profunda as perforate the triceps muſcle (which, in ſome meaſure, forms a plane of diviſion betwixt the fore and back parts of the thigh), and are diſtributed amongſt the flexor muſcles.

4, The extreme branches of the INTERNAL CIRCUMFLEX ARTERY, Plate XV. 5.—which being frequently a branch of the profunda, is the FIRST PERFORATING ARTERY.

5, The FIRST PERFORATING branch of the profunda, ſent chiefly to the triceps brevis.

6, The SECOND PERFORATING ARTERY, ramifying to the biceps, ſemi-membranoſus, and ſemi-tendinoſus muſcles. Theſe muſcular arteries, the extreme branches of the internal articular arteries, the firſt and ſecond perforating arteries, form a train of inoſculations, reaching from the iſchiatic artery to the popliteal artery.

7, The TRUNK OF THE POPLITEAL ARTERY, where it has perforated the triceps muſcle, and lies cloſe upon the bone.

8, A conſiderable muſcular branch, ſent off as the artery is paſſing the triceps muſcle, and which is chiefly diſtributed to the biceps.

If, as in all probability, there was in this ſubject a great muſcular branch coming off oppoſite to this one, and which in many ſubjects is diſtributed to the inner hamſtring muſcles and vaſtus internus, it would be the FIRST PERFORATING ARTERY of the popliteal artery; while this (8) is THE SECOND PERFORATING ARTERY. THE PERFORATING ARTERIES of the popliteal artery, are thoſe branches which eſcape from the hollow betwixt the hamſtring tendons, and paſs through the flexor muſcles.

9, A muſcular branch to the ſemi-membranoſus muſcle, which ſends a long reflected branch, inoſculating with the perforating arteries of the profunda, upon the great faſcia of the thigh.

The ARTICULAR ARTERIES, which are branches of the popliteal artery above the condyles, are in ſyſtematic arrangement three in number, but they are very irregular. That branch however marked (10), the lower and external articular artery going over the outer condyle, is very conſtant; while for the internal articular artery, as it has occurred here, there is more frequently ſubſtituted leſſer branches.

11, THE AZYGOS ARTERY OF THE JOINT, which takes a middle courſe betwixt the condyles, is frequently a branch of the outer articular artery.

12, The great iſchiatic nerve ſeen through its whole courſe.

DISSECTION OF THE BACK PART OF THE LEG.

IN page 121, when treating of the popliteal aneuriſm, a ſlight deſcription of the faſcia which ſtretches acroſs the hamſtring tendons, and of the ſituation of the great veſſels and nerves, was given. To purſue the diſſection of the popliteal veſſels and nerves, the faſcia upon the belly of the gaſtrocnemius muſcle is to be ſlit up. We find there the leſſer ſaphena vein coming up from the outſide of the foot, its trunk lies under the faſcia, and ſhines through it while yet entire; it joins the popliteal vein betwixt the hamſtring tendons, about two inches above the condyles; in its courſe it forms ſeveral remarkable inoſculations with the ſaphena major, and is accompanied by two ſuperficial branches from the peroneal and fibial nerves. We find alſo that the great ſaphena vein upon the inſide, is accompanied with a ſmall nerve, the INFERIOR INTERNAL CUTANEOUS NERVE; which ariſes from the ſchiatic nerve ſoon after it has come out from the pelvis, and which emerges only at the inſertion of the ſartorius muſcle.

Having diſſected the parts in the back of the knee joint, and the gaſtrocnemius muſcle, particular attention ſhould be paid to the aponeurotic expanſion, inveſting the flexor muſcles, and poſterior tibial artery and nerve; for betwixt the ſtrong tendon of the gaſtrocnemius and the edge of the tibia, the ſtrong croſs fibres of a faſcia are extended; and even this being ſlit up, a tough cellular membrane intervenes, betwixt the flexor muſcles and the artery and nerve; and theſe muſcles are further encloſed in a peculiar aponeurotic membrane.

Theſe things are remarked, as in themſelves important, and to be noticed in the diſſection not explained in the Plate.

EXPLANATION OF PLATE XVIII.

FIG. 1.—MUSCLES.

A, The inner hamſtring tendons, formed by the ſemi-membranoſus and ſemi-tendinoſus muſcles.

B, The outer hamſtring, or tendon of the biceps cruris.

C C, The origins of the GASTROCNEMIUS MUSCLE, from the two condyles of the thigh bone. The belly of the muſcle D D, is ſcarcely more than indicated by an outline.

E, The belly of the SOLEUS MUSCLE, appearing from under the gaſtrocnemius; this muſcle ariſes by two heads from the upper part of the tibia and fibula—it forms a broad flat muſcle, of which the margin only is ſeen here—its fibres concentrating to a middle tendinous line F, coaleſce with the tendo-achillis F; which is thus common to both theſe muſcles.

Fig. I.

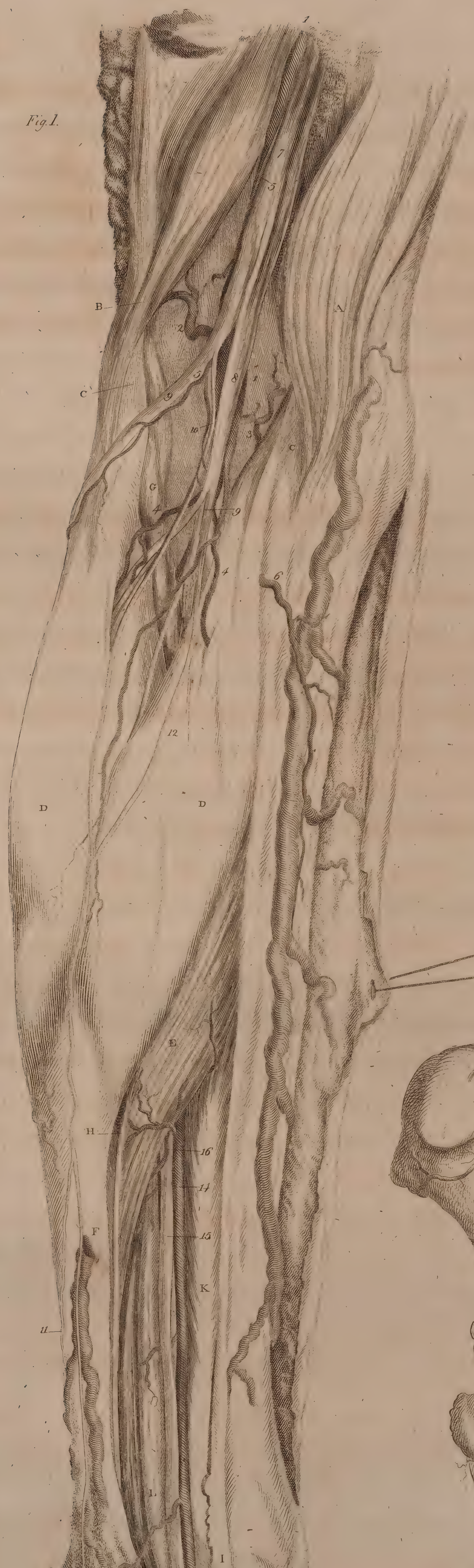
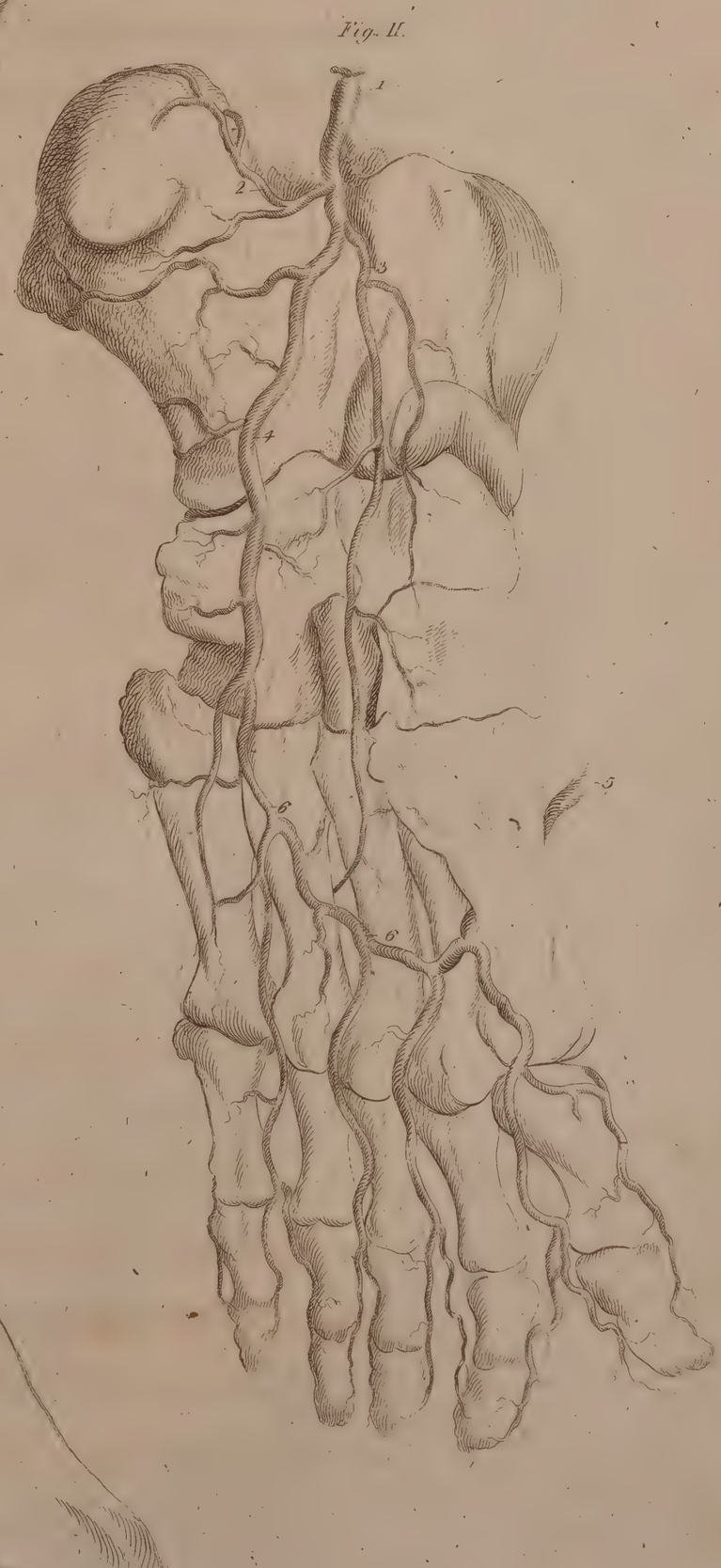


Fig. II.



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G, The PLANTARIS MUSCLE, which riſing from the external condyle of the thigh bone, lies under the gaſtrocnemius muſcle—it has a ſmall fleſhy belly of about three inches, and terminates in the delicate tendon H, which lies betwixt the inner head of the gaſtrocnemius and ſoleus, as the oblique direction of the muſcle indicates—its tendon adheres to, and is implanted alongſt with the tendo-achillis.

I, The tendon of the TIBIALIS POSTICUS, paſſing in its ſheath under the inner ancle. This muſcle riſes from the back part of the tibia and fibula, and interoſſeous ligament, while its head ſtretches through betwixt the bones, and takes its origin from the tibia before—its tendon ſpreads widely over the tarſal and metatarſal bones in the ſole of the foot.

K, The FLEXOR LONGUS DIGITORUM.—It ariſes from the back part of the tibia. The fibres converging from the outer and inner ſharp edges of the bone, encloſe the tibialis poſticus, which lies cloſe upon the bone—inſerted into the laſt bone of the four leſſer toes.

L, The FLEXOR LONGUS POLICIS PEDIS.—It riſes from the back part of the fibula, a little below its head, and continues its origin almoſt to its lower extremity—paſſing under an annular ligament, it is inſerted into the laſt joint of the great toe.

ARTERIES AND NERVES IN THE BACK OF THE KNEE-JOINT.

1, The POPLITEAL ARTERY, where it lies deep betwixt the hamſtring tendons.

2, The UPPER AND OUTER ARTICULAR ARTERY.—It is ſeen again in Plate XX. Fig. 3.—It paſſes here under the tendon of the BICEPS CRURIS.

3, The UPPER AND INTERNAL ARTICULAR ARTERY paſſing through the tendon of the triceps, and piercing the lower margin of the vaſtus internus; it is diſtributed upon the inſide of the knee joint, and inoſculates with the lower articular artery of the ſame ſide, a branch alſo of the popliteal artery; but which takes a courſe more obliquely downwards, and under the internal condyle *.

4, 5, Theſe twigs from the popliteal artery run down ſuperficially upon the heads of the gaſtrocnemius muſcle; they ſend down long twigs in company with the leſſer ſaphena vein and ſuperficial nerves; and more conſiderable branches to the origin of the ſoleus muſcle. But there is a more ſlender twig of artery (5, 5), accompanying the peroneal and cutaneous nerves, prolonged from the popliteal artery, high in the ham.

6, The lower and internal articular artery.

The popliteal artery, and theſe articular arteries lie deep and near the bone. The iſchiatic nerve, and the branches it ſends off, are more ſuperficial.

7, The iſchiatic nerve—yet here, though in cloſe contact, the tibial and peroneal nerves have already ſplit.

8, The tibial nerve—where it is ſinking under the gaſtrocnemius and ſoleus, to appear again in company with the poſterior tibial artery.

9, The peroneal nerve, which paſſing over the fibula, ſinks amongſt the muſcles on the outer and fore part of the leg—it is ſeen ſplitting into a ſuperficial and a deep ſeated nerve.

10, A branch from the peroneal nerve, from which the poſterior and inferior cutaneous nerve (11) is finally derived, and likewiſe that twig called communicans peronei, which joining with (12) the ramus communicans tibiei is finally diſtributed on the outſide of the foot and toes. (Plate XX. 9.)

13, The VENA SAPHENA MAJOR—a little drawn from its ſeat, by the pulling of the integuments.

14, The POSTERIOR TIBIAL ARTERY lying parallel with the flexor communis, and with the accompanying

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* The external and inferior articular artery; making in all the four articular branches of the popliteal artery—is leſs conſtant or important. The recurrent branch of the anterior tibial artery ſometimes taking its place.

nerve. Theſe branches which are ſeen going off, are nameleſs muſcular twigs to the ſoleus, flexor communis digitorum, and flexor policis.

15, The TIBIAL NERVE.

16, A muſcular branch from the fibular artery. Theſe parts do not lie thus expoſed, but are covered with aponeurotic membranes, as mentioned in the introductory remarks to this diſſection.

FIG. 2.—This faint ſketch of the bones and arteries of the foot is given to illuſtrate the general courſe of the poſterior tibial artery; and to account for thoſe branches which are only partially ſeen in the next diſſection.

When the poſterior tibial artery (1) has got into the hollow of the inner ancle, cloſe by the heel-bone, it ſends out two branches; one goes up upon the ancle-joint, and the other (2) ramifies over the heel-bone, and inoſculates with the fibular artery. Proceeding onwards in the groove of the os calcis, it ſends off a very principal branch, viz. the INTERNAL PLANTAR ARTERY (3)—which continues a more ſuperficial branch above the tendons, while the main artery, the EXTERNAL PLANTAR ARTERY (4) takes a courſe more circuitous, deeper under the muſcles, but more towards the outer ſide of the foot.

5, The anterior tibial artery.

6, 6, The plantar arch lying upon the metatarſal bones, and formed by the great inoſculation of the external plantar artery (4), and the anterior tibial artery (5). From this arch are ſent off the arteries to the toes, viz. the perforating arteries, which, going deep betwixt the bones, inoſculate with the interoſſeous arteries of the fore part of the foot.

Drawn by Charles Bell

Pub.d as the Act Directs.

Engraved by J. Stewart Edin.r

FURTHER DISSECTION OF THE BACK PART OF THE LEG AND OF THE FOOT.

To proceed with the diſſection of the muſcles, nerves, and blood-veſſels of the calf of the leg, the heads the gaſtrocnemius muſcle are to be lifted from their origin, and the muſcle allowed to hang by the ſoleus; we then ſee the plantaris through its whole length, lying betwixt the fleſhy bellies of theſe muſcles. By ſeparating the ſoleus muſcle from the back of the tibia, and folding the ſide of it over towards the outſide of the leg, we have the view of the parts given in Plate XIX. The ſmaller flexor muſcles are laid open—the branches of the iſchiatic nerve and poſterior tibial nerve are ſeen through all its extent, and all the important branches of the popliteal artery. We find the poſterior tibial artery and the fibular artery running parallel to each other, high in the leg; the fibular artery is rather the more ſuperficial; but as they proceed downwards, the fibular artery ſinks behind the flexor of the great toe, and gets deep betwixt the bones. The anterior tibial artery, the firſt of theſe three great diviſions of the popliteal artery, is ſeen going through betwixt the heads of the bones, to gain the fore part of the leg. (See Plate XX. Fig. 1). It is ſcarcely poſſible to give a deſcription of the deep ſeated veins accompanying theſe arteries; for, after a ſucceſsful injection of them, they are ſo numerous, as to choke and hide the arteries from the view. For as there are two VENÆ COMITES to each artery; as the tibial and peroneal arteries lie ſo little removed from each other, and as the veins form frequent communications, the arteries are involved in an irregular meſh of veins.

EXPLANATION OF PLATE XIX

PARTS DISSECTED IN THE LEG.

A, The head of the tibia.

B, The GASTROCNEMIUS MUSCLE in outline.

C, The head of the SOLEUS MUSCLE raiſed from its origin from the tibia.

D, Marks where the tendon of the ſoleus coaleſces with the tendon of the gaſtrocnemius muſcle, to form together the tendo-achillis.

E, The ſmall tendon of the PLANTARIS, which lies betwixt the two muſcles.

F, The MUSCULUS POPLITEUS, which ariſes from the external condyle of the os femoris, paſſes fleſhy over the joint, adheres to the capſule, and is inſerted into the internal edge of the tibia.

G, The FLEXOR COMMUNIS DIGITORUM.

H, The tendon of TIBIALIS POSTICUS.

I, The FLEXOR POLICIS PEDIS LONGUS.

K, The PERONEUS BREVIS ſeen retired.

ARTERIES AND NERVES ON THE LEG.

1, The POPLITEAL ARTERY, before dividing into the three arteries of the leg. It is here that by the violent action of the muſcles, it is ſometimes lacerated, or ſo injured, as to produce an aneuriſm, deſtroying the bones and joint.

2, The ANTERIOR TIBIAL ARTERY, where it is about to paſs through betwixt the tibia and fibula.

3, The POSTERIOR TIBIAL ARTERY, where it lies betwixt the belly of the ſoleus and the long flexor muſcles of the toes; and has its name from its ſituation in oppoſition to the anterior tibial artery.

4, 4, The PERONEAL ARTERY.—This artery is ſometimes a branch of the anterior tibial artery—taking a direction parallel with the fibula, and upon the inſide of that bone, it ſupplies the peroneal muſcles and flexor of the great toe—it ſends out ſo many muſcular arteries, (ſome of which inoſculate again with the trunk), that it is much diminiſhed before it gains the lower head of the bone. Where the peroneal artery is hid under the flexor tendons, and where it lies betwixt the lower heads of the tibia and fibula, it ſplits, and ſends a branch betwixt the bones, to be diſtributed upon the outer ancle, which therefore is called the external peroneal artery.

5, The INTERNAL, or POSTERIOR PERONEAL ARTERY.—This is properly the termination of the peroneal artery—it is ſeen forming a remarkable inoſculation with the poſterior tibial artery; while its branches are chiefly ſent upon the inſide of the heel-bone, and above the plantar expanſion, upon the outſide of the foot, and inoſculating with the outer plantar artery (6).

6, The ISCHIATIC, or POPLITEAL NERVE.

7, The PERONEAL NERVE going over the head of the fibula.

8, MUSCULAR NERVE to the gaſtrocnemius muſcle.

9, A branch perforating the interoſſeous ligament.

10, The TIBIAL NERVE, where it paſſes through the head of the ſoleus, and betwixt that muſcle and the flexor digitorum—it is held aſide by a pin, ſo that the muſcular branches which it gives to the ſoleus and long flexor muſcles, may be ſeen ſtretching over the poſterior tibial artery.

11, Here the TIBIAL NERVE is about to paſs under the annular ligament, and to divide into the internal and external plantar nerves.

PARTS SEEN ON THE SOLE OF THE FOOT.

A tough granulated fat is betwixt the hard ſkin of the ſole of the foot, and the plantar aponeuroſis, which adheres ſtrongly to the aponeuroſis, and is with difficulty diſſected from it. The plantar aponeuroſis paſſes from the heel to the root of the toes, covering all thoſe parts which fill up the arch of the bones; it therefore gives elaſticity to the foot, binds down, ſtrengthens, and gives origin to the leſſer muſcles—in wounds and bruiſes it retains the blood or matter, and binds the inflammation and ſwelling, ſo as to occaſion excruciating pain, and cauſe the deſtruction of the internal parts.

K, The middle portion of PLANTAR APONEUROSIS, under which are contained the tendons of the long flexor muſcles, and the flexor brevis digitorum.

L, The internal lateral portion of the plantar aponeuroſis, which inveſts the ſhort muſcles of the great toe; a ſtrong faſciculus of fibres is ſeen connecting this with the middle portion.

M, The external lateral portion of the aponeuroſis. Fibres are ſent down forming partitions, or claſſing the muſcles and tendons of the foot.

N N N, The TENDONS OF THE FLEXOR COMMUNIS—the aponeurotic expanſion ſplitting to give them paſſage.

O, The tendon of the flexor of the great toe.

P, ABDUCTOR of the great toe.

Q, ABDUCTOR of the little toe.

12, The EXTERNAL PLANTAR ARTERY making a curve, and appearing more ſuperficially here, before it turns in to form the great arches from which the arteries of the toes are ſent off.

13, 13, 13, The ARTERIES OF THE LESSER TOES from the plantar arch.

14, The ARTERY OF THE GREAT TOE proceeding from the anterior tibial artery, where it is about to form the great inoſculation with the arch, or termination of the poſterior tibial artery.

15, The EXTERNAL PLANTAR NERVE accompanying the artery.

16, The diſtribution of the internal plantar nerve to the toes, appearing from betwixt the tendons, and ſplitting upon the arteries.

DISSECTIONS OF THE FORE PART OF THE LEG AND FOOT.

On laying open the integuments on the fore part of the thigh, we have to take notice again of an important faſcia. The faſcia is continued down the leg from the hamſtring tendons—it takes a firm hold of every acceſſible point of bone; the head and ridge of the tibia, the fibula, and the whole capſule of the knee, is covered and ſtrengthened by the faſcia—below, upon the ancle, it is gathered into ſtronger faſciculi, which encircle the tendons confining them, and forming the annular ligament.

The ſaphena vein upon the inſide of the tibia accompanied by the internal cutaneous nerve, ſhould not be overlooked. Upon the outſide of the leg, about its middle part, and before the fibula, is ſeen a great branch of the peroneal nerve coming out through the faſcia; and a little further down another branch; both ſpreading extenſively over the fore part of the foot.

To proceed with the diſſection, and bring the parts to correſpond with Plate XX. we diſſect off the faſcia from the extenſor muſcles, ſeparating it from its ſtrong connection with the tibia, and folding it back over till we find it taking a firm hold on the fibula. We find, as it is diſſected up from the tibialis anticus, extenſor policis, extenſor digitorum, communis and peroneus longus, that the ſurface of theſe muſcles are ragged, where they took their origin from the faſcia.

Upon the fore part of the foot, in like manner, an expanſion is ſtretched over the muſcles and tendons, above which run the cutaneous veins and nerves.

EXPLANATION OF PLATE XX.

Fig. 1.—A, The patella—B, Ligament of the patella, connecting it with the head of the tibia.

C, The ridge of the tibia.

D, Head of the fibula—E, Lower end of the fibula, forming the guard of the joint in this direction.

F, The faſcia cut up from the tibia, diſſected off the extenſor muſcles, and held back—its firm origin from the head of the fibula is ſeen, and the manner in which it forms the ligament of the ancle G, by taking a firm hold of the extremities of the bones, and by being ſtrengthened with additional faſciculi of fibres.

MUSCLES.

H, The tibialis anticus muſcle taking its origin from the tibia, and from the tendinous partitions. Its tendon is ſeen in a diſtinct ſheath of the annular ligament—it turns obliquely over the foot, and is inſerted into the os cuneiforme internum.

I, The EXTENSOR POLICIS.—It ariſes from the fibula, paſſes under the ligament, and over the firſt joint of the great toe, to be inſerted into the ſecond.

K, The EXTENSOR LONGUS DIGITORUM BREVIS.—It ariſes from the head of the tibia, from the faſcia and tendinous partitions betwixt the bones and edge of the fibula. Its fibres are ſeen to ſplit as they paſs under the ligament, and are ſent to the four leſſer toes, accompanied by the tendons of the extenſor digitorum brevis.

L, The PERONEUS LONGUS ariſing from the head and ridge of the fibula, and from the upper part of the tibia. Its tendon paſſes behind the outer ancle. It is inſerted into the metatarſal bone of the great toe and os cuneiforme magnum.

The PERONEUS BREVIS lies under the laſt muſcle. It ariſes from the ridge of the fibula and interoſſeous ligament, and its tendon paſſes in the ſame ſheath with the peroneus longus. Its tendon M runs on the outer edge of the foot, and is inſerted into the metatarſal bone of the little toe.

N, N, Mark the faſciculi of the EXTENSOR DIGITORUM BREVIS. It riſes from the heel-bone and annular ligament—its ſmall tendons run ſo obliquely inwards, as to croſs thoſe of the long extenſor paſſing between them. That tendon which is ſeen going to the great toe is implanted into the firſt bone. The other tendons which go to the three next toes are prolonged alongſt the ſide of the toes, the great tendon gliding betwixt them.

ARTERIES AND NERVES.

1, The moſt important part of the demonſtration is the track of the ANTERIOR TIBIAL ARTERY (1), and its accompanying nerve. The manner in which the ANTERIOR TIBIAL ARTERY paſſes betwixt the heads of the tibia and fibula is ſeen in the laſt plate. It appears here (1), lying deep betwixt the tibialis anticus and extenſor communis digitorum muſcles. It is here guarded by the projecting ridge of the tibia, and covered by the belly of the tibialis anticus muſcle. It gives off alternately to each ſide muſcular branches; as it deſcends, it becomes more ſuperficial, and is much expoſed in workmen to be wounded with the adze, and in the upper part, it lies cloſe upon the interoſſeous membrane; but as it deſcends, it turns round, and lies before the head of the tibia, and paſſes through the annular ligament under the tendon of the extenſor of the great toe.

2, 2, A very remarkable recurrent branch ſent off from the anterior tibial artery, immediately after it has perforated the interoſſeous membrane; from the root of this twig, there is ſent down under the fleſhy head of the extenſor digitorum communis, a ſlender muſcular branch. The twig which is ſeen here, perforates the head of the tibialis anticus muſcle, runs upon the head of the tibia, gets under the ligament of the patella, while its extreme twigs are extended over the ligament of the knee, and inoſculate with the ARTERIA ARTICULARIS SUPERIOR EXTERNA (1) appearing here from under the tendon of the biceps muſcle, and derived from the popliteal artery.

4, The peroneal nerve which we ſaw in the laſt plate, derived from the great iſchiatic nerve in the ham.

5, Its deep ſeated branch which appears again in company with the artery, and ſeparated from it by a pin (7).

6, The ſuperficial branch which is diſtributed to the peroneal muſcles, and ſuperficially upon the fore part of the foot, coming out from beneath the faſcia at (8), and turned aſide by the raiſing of the faſcia.

9, A nerve likewiſe diſtributed upon the fore part and ſide of the foot, and derived from the cutaneous nerve, which in the laſt plate is ſeen running down ſuperficially upon the tendon of the gaſtrocnemius muſcle, properly the nervus communicans tibiei, which is obſerved to join with the NERVUS COMMUNICANS PERONEI on the back of the leg.

10, The commencement of the vena ſaphena; here we fix our tubes to inject the whole ſyſtem of the veins of the leg.

FIG. 2.—This ſketch of the foot from Haller is added chiefly to ſhow the further diſtribution of the anterior tibial artery.

A, The tendon of the tibialis anticus muſcle.

B, The tendon of the extenſor policis.

C, The tendons of the extenſor communis digitorum.

D, The tendon of the peroneus brevis.

E, The extenſor brevis digitorum pedis.

Plate XX.

Fig I

Fig II

Drawn by C. Bell and Engraved by I. Stewart Edin.r

DISTRIBUTION OF THE ARTERY.

1, ANTERIOR TIBIAL ARTERY.

2, Muſcular branches.

3, INTERNAL MALEOLAR ARTERY.

4, EXTERNAL MALEOLAR ARTERY—it inoſculates with the fibular and tarſal arteries.

5, The TARSAL ARTERY diſtributed to the bones and joints of the tarſus, and to the extenſor brevis—it ſometimes gives off the interoſſeous arteries.

6, Branch to the inſide of the foot, and to the muſcles of the great toe; it inoſculates with other branches of the anterior tibial artery, and with the plantar artery.

7, 7, The termination of the trunk of the anterior tibial artery going down by the metatarſal bone of the great toe into the ſole of the foot.

8, The metatarſal artery giving off the interoſſei.

9, Arteria dorſalis policis.

10, Branches of the plantar artery to the toes.

END OF VOLUME THE FIRST.

DIRECTIONS FOR THE BINDER.

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APPENDIX

TO

SYSTEM OF DISSECTIONS,

PART FIRST;

CONTAINING

ADDITIONAL DESCRIPTIONS

OF THE

ABDOMINAL MUSCLES.

SECOND EDITION.

BY CHARLES BELL,

FELLOW OF THE ROYAL COLLEGE OF SURGEONS.

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1801.

APPENDIX.

AS I have propoſed to take every poſſible opportunity of correcting and amending the deſcriptions of this book, and of giving additional Tables, I was happy to have it in my power, during laſt winter, to add the following Plate, drawn from a very ſtrong and well-proportioned ſubject, as it lay diſſected for public demonſtration. It is not in every ſubject that we find theſe muſcles ſtrong and eaſily diſſected; but in ſailors, eſpecially in boatmen, we have them particularly well marked. In conſequence of their habitual exertion in raiſing their bodies by their arms, or in pulling at the oar, the abdominal muſcles acquire a maſſineſs and ſtrength not to be ſeen in other workmen.

In the firſt Plate, the EXTERNAL OBLIQUE MUSCLE (B b b) and its tendons, with the more ſuperficial parts, are ſeen on the left ſide; while, on the right ſide, the EXTERNAL OBLIQUE MUSCLE (F f) being diſſected off, the RECTUS and the INTERNAL OBLIQUE MUSCLES (D E) are ſeen. But to underſtand the anatomy of theſe muſcles, and of the parts connected with them; to underſtand, in particular, the anatomy of the ring, and the nature of the tendinous lines, the linea ſemilunaris, and the linea alba; it is neceſſary to have a more complete view of the diſſection of the internal layers of muſcles.—In this additional Plate of the abdominal muſcles, therefore, the right ſide of the body is ſhown further diſſected than in the firſt Plate—The EXTERNAL OBLIQUE, which is held out by the hook, and the INTERNAL OBLIQUE, which is held out by the fingers of the diſſecter, are diſſected up from their places, ſo as to ſhow the TRANSVERSALIS MUSCLE lying in its place—We ſee all the connections of the muſcles at the LINEA SEMILUNARIS; we ſee the deficiency of the TRANSVERSALIS MUSCLE on the lower part, and the bowels protruding, covered only by the PERITONEUM; we ſee alſo the manner in which the RING is formed by the tendon of the external oblique; the origin of the CREMASTER MUSCLE; the manner in which the cord lies in the groove of Paupart's ligament; and the ſituation of the EPIGASTRIC ARTERY.

In Fig. 2. we have an enlarged view of the internal ſtructure of the ring, the relative ſituation of the ſpermatic cord, cremaſter muſcle, and epigaſtric artery. In this view of the parts we ſee only the tendon of the external oblique raiſed, the fibres of the internal oblique in their natural ſituation, and the cremaſter muſcle derived from them.

EXPLANATION OF ADDITIONAL PLATE I.

To bring the parts into the ſituation in which they are now preſented to us, we diſſect in the manner deſcribed, page 6. under the title of Second Stage of Diſſection.—Here the external oblique muſcle of the

right ſide is diſſected from its ſerrated origins upon the ribs, and from its origin from the ſpine of the os ILII, and folded back; and as it is taken up, it is cut from its connections at Paupart's ligament, with the faſcia of the thigh, ſo as to be left at its final inſertion into the creſt of the os PUBIS. When the external oblique is diſſected up, until we find its tendon intimately connected at the linea ſemilunaris, we then ſee the internal oblique muſcle, which is marked in the firſt Plate D E, taking its origin from the os ilii, and ſpreading its fibres upwards to the ribs directly acroſs to the linea ſemilunaris, and obliquely downwards to the pubis; at the lower angle we ſee the fibres paſſing off from this muſcle to form the cremaſter muſcle. We then cut this muſcle from its origin, and diſſect it back, as we have done the external oblique muſcle; betwixt the layers of theſe muſcles there is much adipoſe membrane, which muſt be carefully diſſected, as I have formerly deſcribed.

A A, The INTEGUMENTS diſſected from the belly.

B, The RIBS of the right ſide.

C, The SPINE of the ilium.

D, The TENDON of the EXTERNAL OBLIQUE MUSCLE of the left ſide, where it forms the ſheath of the rectus muſcle.

E, The LOWER PORTION OF THE TENDON OF THE LEFT SIDE, going down to form the RING.

F, The SPERMATIC CORD of the ſame ſide.

G, That part of the EXTERNAL OBLIQUE MUSCLE of the right ſide, which takes its origin from the os ILII, held out by the hook.

H, The TENDON of the EXTERNAL OBLIQUE MUSCLE, where it is inſerted into the creſt of the os PUBIS. What is ſaid in page 98. and 99. under the title of the LIGAMENT OF THE THIGH, and its connection with the ABDOMINAL RING, will now be fully underſtood; for it may be ſeen here, that that portion of the tendon of the ABDOMINAL MUSCLE, which forms the lower PILLAR OF THE RING, is inſerted flat and horizontally into the os PUBIS; ſo that when the tendon is in its natural ſituation, the ſpermatic cord lies in it as in a groove, and when cutting up the femoral ligament, or Paupart's ligament, as it is called, to free the CRURAL HERNIA from ſtricture (I ſpeak from experiments on the dead body), if we carry our knife obliquely inwards, ſo as to avoid the apparent direction of the epigaſtric artery, we cut upon the cord before we have cut through the ligament.

I, The SPERMATIC CORD, coming out from amongſt the fat, and from under the peritoneum. It is ſeen to proceed obliquely downwards, and to paſs over the tendon H into the ſcrotum. There appears no veſtige of the original formation of the coats of the teſticle, as explained in page 79.

K, Small nerves paſſing from the lumbar nerves to the ſpermatic cord.

L, Fibres of the FASCIA OF THE THIGH, which were connected irregularly with the tendon of the EXTERNAL OBLIQUE.

M, The FEMORAL ARTERY.

N, The great FEMORAL VEIN.

O, The EPIGASTRIC ARTERY. It is this artery which is marked Plate I. fig. 2. and it is ſeen there, that in the femoral hernia, this artery muſt ſtretch over the neck of the protruding ſac. Although there be no inſtances of this artery being cut in the operation for femoral hernia, yet we ought carefully to attend to it; for in all probability the caution which has been hitherto inculcated, in regard to this artery, has been a principal cauſe of its never having been cut. But, indeed, if we attend to the natural ſituation of the parts before the ligament is nicely diſſected, we ſhall ſee, that the femoral artery gives off this epigaſtric branch ſome way higher up than the edge of the ligament, and the artery taking its direction obliquely upwards, is conſiderably removed from the knife when the tendon is to be cut in the middle betwixt the ſpermatic cord and the femoral artery.

Beſides, in the crural hernia, it will be always ſufficient to cut the neck of the ſac, and the inflamed

I

II

Engraved by I. Grant

Drawn by Chas. Bell

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and condenſed cellular membrane, ſcarcely ſnipping the edge of the tendon. Here, too, it may be obſerved, the edge of the tendon is protruded downwards from its natural ſituation. It may be obſerved alſo, that it is the ſwelling of the ſofter and more vaſcular parts conſtricted by the tendon which cauſes incarceration, or ſometimes the flatus or fæces collected in the protruded gut itſelf. I have found in operating on the inguinal hernia, that the conſtriction was not in the ring, but in the peritoneal ſac, fully two inches within it; and in the caſe to which I allude, the ſtrangulation was ſo complete that the gut was gangrened. Thus it is, that in thoſe old hernias, the adheſions of the membranes within the ring having become very ſtrong, and the ſac condenſed, occaſional inflammation or congeſtion in the gut, may cauſe a ſtrangulation independently of the external ring of the tendons. See further what is ſaid, page 82. under the title of METHOD OF DISSECTING HERNIÆ.

Another circumſtance may be obſerved in this figure regarding the femoral ligament: What has been ſaid by ſome authors of the ſtricture of the femoral hernia, viz. that it is not upon the external margin of the ligament that the tenſion is found, but more internally under the ligament, and towards the pubis, is not a conceit, but likely to happen from the natural ſtate of the parts; this ſtrangulation being evidently formed by the inner margin of that broad horizontal inſertion of the tendon into the bone.

But in all the caſes in which I have had an opportunity of diſſecting femoral hernia, the patients have been females; and the parts were ſo inflamed and condenſed together, that I could ſcarcely diſtinguiſh the courſe of the epigaſtric artery. In thoſe caſes where I ſhould have been moſt attentive to this circumſtance, the operation had been unſucceſsfully performed, or from the mortification of the gut and the eſcape of the fæces, there had been extenſive ſinuſes, which prevented me from obſerving what really formed the ſtrangulation. It muſt be recollected, that in diſſecting the tendon of the pſoas parvus muſcle, we ought to attend to its inſertion into the os pubis, and connection with the tendon of the external oblique; for in all likelihood the deficiency in the pillars of the ring, occaſioning hernia, depends upon this connection, perhaps in ſome caſes the want of this muſcle.

P, The peritoneum ſeen, with the inteſtines ſhining under it. This outer ſurface of the peritoneum is not ſmooth like the inner ſurface, which allows the inteſtines to glide eaſily under it, for it here is connected with the muſcles by cellular membrane. It is here that inflammation, in conſequence of wounds, or after the operation for the ſtone or puerpueral inflammation, ſometimes forms extenſive abſceſſes.

Q Q, The INTERNAL OBLIQUE, held out by the hand of the diſſecter.

R, CREMASTER MUSCLE, being a faſciculus of fibres derived from the laſt muſcle.

S, INSERTION of the INTERNAL OBLIQUE into the LINEA SEMILUNARIS, or rather the union and intermixing of the fibres of this muſcle with the tendons of the other muſcles at this line.

T, The TRANSVERSALIS ABDOMINIS. Its ſtrong fleſhy fibres are ſeen to run directly acroſs the belly. It ariſes from the ſix lower ribs forming indigitations with the DIAPHRAGM from the tranſverſe proceſſes of the four lower lumbar vertebræ, and from the ſpine of the ilium.

X X, The termination of the muſcular part of the TRANSVERSALIS MUSCLE before mingling its tendon with that of the INTERNAL OBLIQUE, S.

V. That part of the MUSCLE which ariſes from the ribs.

The origin of the RECTUS MUSCLE from the xiphoid cartilage, and the mixing of its fibres with the great pectoral muſcle, is diſtinctly ſeen.

EXPLANATION OF FIG. II.

In this figure we have an enlarged and more diſtinct view of the diſſection of the ABDOMINAL RING.

A, The SPERMATIC CORD emerging from the fat, and from under the PERITONEUM.

B, The SPERMARIC CORD after it has paſſed the tendon of the EXTERNAL OBLIQUE MUSCLE.

C, The TENDON of the EXTERNAL OBLIQUE MUSCLE.

D, The FIBRES of the INTERNAL OBLIQUE MUSCLE.

E, The CREMASTER MUSCLE; being a few muſcular fibres derived from the INTERNAL OBLIQUE MUSCLE, and deſcending through the RING, and expanding upon the CORD.

F, The EPIGASTRIC ARTERY.

G, A branch of the EPIGASTRIC ARTERY going to the cord.

I, Fibres of the faſcia of the thigh.

K, A branch of the inguinal nerves going to the cord.

PRINTED BY MUNDELL & SON,
ROYAL BANK CLOSE, EDINBURGH.

A SYSTEM OF DISSECTIONS.

PART I.

CONTAINING

THE MOST IMPORTANT DISSECTIONS OF THE ARTERIES, VEINS, AND NERVES, OF THE ARM; WITH REMARKS CONNECTING THE ANATOMY AND SURGERY OF THE PARTS.

A

SYSTEM

OF

DISSECTIONS.

EXPLAINING THE

ANATOMY OF THE HUMAN BODY,

THE

MANNER OF DISPLAYING THE PARTS, AND THEIR VARIETIES IN DISEASE.

VOLUME THE SECOND.

The Second Edition.

CONTAINING

THE DISSECTIONS OF THE ARM, OF THE NECK AND FACE, OF THE NERVOUS SYSTEM OF THE VISCERA, AND OF THE BRAIN.

WITH PLATES.

By CHARLES BELL,

FELLOW OF THE ROYAL COLLEGE OF SURGEONS.

EDINBURGH:

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1805.

SYSTEM

OF

DISSECTIONS.

DISSECTION

OF THE

ARTERIES, VEINS, AND NERVES OF THE ARM.

OF THE AXILLA.

THE intricacy of the anatomy of the axilla, with the danger of wounds, and frequency of operations in it, make this a very important dissection; a piece of anatomy, of which no surgeon can be ignorant, without risking imminent danger to his patients, and feeling in himself a state of mind far from enviable. It is evident enough, that, during an operation in the axilla, the surgeon cannot distinguish parts; he is operating among deep parts, feeling rather than seeing; endeavouring to insulate the glands with his fingers, and tearing rather than cutting; but a thorough knowledge of the parts is necessary to give him boldness and decision; which are most of all required in operations upon parts so near the great trunks, where the smaller branches bleed with an impetuous jet, and where the tourniquet cannot be applied.

In making this dissection of the axilla, we must be especially careful to keep all the parts in their natural situation, so as to be able to judge accurately of their relation to each other in the living body. We have but a small space to dissect; but our success so much depends on our more general knowledge of the branching of the arteries, and the course and proximity of the nerves of the arm, that the student can scarcely expect to make an elegant dissection, or thoroughly to understand the relation of the parts, unless he have first dissected for the general anatomy of the arm before he attempts that of the axilla. He should at least study the following dissection of the arteries and nerves before he makes his dissection of the axilla.

The subject from which the engraving, illustrating this dissection, was made, was left on the table supine, with the arm stretched out from the body. The DELTOID MUSCLE, the PECTORALIS MAJOR, the SUBCLAVIAN MUSCLE, the LATISSIMUS DORSI, TERES MAJOR, and SERRATUS MAJOR ANTICUS, are the muscles dissected; the origin and insertion, and general course of which, the student will be acquainted with before he begins his dissection. These muscles are not at once to be fairly dissected as muscular parts; on the contrary, on account of the glands, small cutaneous nerves, and blood-vessels, they must be cautiously dissected. To these nerves and arteries indeed, the chief attention must be paid; the muscles form only a secondary consideration, and are to be nicely cleaned only after the more important parts are extricated from the cellular membrane.

EXPLANATION OF PLATE I.

BONES AND MUSCLES.

A, The integuments dissected from the axilla and inside of the arm, with numerous cutaneous nerves attached.

B, The integuments thrown back from the arm.

C, The CLAVICLE.

D, The subclavian muscle. It rises from the cartilage of the first rib, diverges with fleshy fibres, and is inserted into the clavicle.

E, The DELTOID MUSCLE. It rises in three fasciculi, viz. from the clavicle, from the acromion process, from the spine of the scapula; it is inserted into the arm bone.

F, The PECTORALIS MAJOR MUSCLE. It takes its origin from the sternum, clavicle, and cartilages of the fifth and sixth ribs; its tendon, twisting, is inserted into the arm bone one third from its head.

G, The LATISSIMUS DORSI MUSCLE, coming round from the back, where it takes its broad origin from the back part of the spine of the ilium, the os sacrum, the vertebræ of the loins, and seven inferior vertebræ of the back, and by slips from the inferior ribs. From this extensive origin, this muscle concentrating its fibres, and twisting its tendon as it passes towards the axilla, is inserted into the arm bone.

The tendons of these two muscles, the pectoral muscle, and latissimus dorsi, by passing across from the chest to the arm bone, so far removed from its head, form this important cavity of the axilla. The triangular hollow betwixt the ribs, these flat muscles, and the arm bone, is filled with loose cellular membrane, and the axillary glands, while the important vessels and nerves are defended by the tendons.

H, The SERRATUS MAJOR ANTICUS. It rises by fleshy slips from the nine superior ribs. This muscle passing backwards, and under the scapula, to be inserted into its base, forms a fleshy cushion, upon which the bone glides easily. Balls have lodged here under the scapula, giving rise to most distressing symptoms, and it is with difficulty that they are extracted.

I, TERES MAJOR. This muscle rises from the rough under-edge of the scapula and lower angle, adheres to the infra-spinatus muscle, and passes directly across to be inserted with the latissimus dorsi.

The TERES MINOR lies close to the lower edge of the scapula, attached to the infra-spinatus muscle, and to the capsular ligament: This muscle, and the infra-spinatus, supra-spinatus, and subscapular muscles, send their tendons over the head of the arm bone, surround it, adhere closely, and strengthen the capsular ligament.

K, The BICEPS FLEXOR CUBITI.

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Fittler sculp.

L, The CORACO-BRACHIALIS, as the name implies, passing from the coracoid process of the scapula to the arm bone.

M, The TRICEPS EXTENSOR CUBITI.

ARTERIES AND GLANDS.

1, The great group of lymphatic, or absorbent glands of the axilla, which, when diseased, and clustering together, form a tumour, which it is dangerous to extirpate.

2 2 2, Other more solitary glands.

3, The SUBCLAVIAN ARTERY, seen passing out alongst with the great plexus of nerves.

4, The THORACICA ACROMIALIS of Haller, or ARTERIA THORACICA HUMERARIA, a branch of the axillary artery; a twig is seen to pass down betwixt the tendons of the pectoral and deltoid muscles in the course of the cephalic vein.

5, The external mammary artery, or long thoracic artery; it is here particularly large, and takes a course more towards the margin of the latissimus dorsi muscle than usual.

6, A division of the external mammary artery. This is more in the general direction of the main branch; while a less important branch is prolonged by the margin of the latissimus dorsi muscle from the subscapular artery. In the two following plates a different distribution of these arteries will be observed.

7, A twig from the ARTERIA THORACICA SUPERIOR, accompanying a cutaneous nerve.

8, The TRUNK of the INTERNAL SCAPULAR ARTERY.

9, The POSTERIOR CIRCUMFLEX ARTERY.

10, The INFERIOR SCAPULAR ARTERY.

NERVES.

a, The great axillary plexus of nerves accompanying the artery.

b, The RADIAL NERVE accompanying the brachial artery.

c, The ULNAR NERVE. On its lower part it is seen to pass under that tendinous expansion which is connected with the tendon of the triceps muscle, and which, in some degree, secures it in its superficial course upon the inner condyle of the elbow joints.

d, The internal cutaneous nerve of the arm, which, in its extensive distribution, is seen in 2, 2, Plate II, of this volume.

e, The CIRCUMFLEX, or ARTICULAR NERVE.

f f, The thoracic nerves.

g, A nerve which crosses the axilla, and is derived from the first intercostal nerve having passed through the intercostal muscles. * I call it the upper internal cutaneous nerve.

h h, Other branches of the intercostal nerves coming out from the thorax, and passing to the integuments of the axilla, and inside of the arm.

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* The *Cutaneus Internus* of Wrisberg, is a nerve described as being derived from the axillary plexus, and sometimes having connecting filaments with the axillary branches of the intercostal nerves; then I presume it to be the same nerve drawn here; but this I conceive to be the most common origin and accurate distribution, We see also, that it is not one nerve only which we have to look for here, but a class of important nerves, which are commonly neglected.

SURGICAL POINTS TO BE CONSIDERED DURING THIS DISSECTION.

No one who knows the strength required in screwing a tourniquet on a limb, will ever think of compressing the subclavian artery with his fingers! This is a point settled, I believe. An instrument might be made to press strongly upon the point under the clavicle, which might stem the impetuosity of the blood, but it never could effectually stop the bleeding in the axilla. Such an instrument could be applied only during your operation, and you would find yourself impeded by it, and your free incisions limited. The common tourniquet may undoubtedly be applied much farther up than usually is conceived to be practicable, by placing the pad deep in the axilla, and resting the screw of the tourniquet fairly on the acromion process of the scapula, an additional strap crossing the breast, and preventing the belt of the tourniquet from slipping off the shoulder. In amputation high in the arm, this might prevent the agitation and shaking of the stump; which is frequently so great, (there being no hold by which to steady it), that it dazzles the sight, and the branches of the artery are with much difficulty drawn out from these numerous nerves to which they are attached in their course.

If morbid matter be absorbed by the lymphatics in the arm, buboes are formed in the axilla as in the lymphatic glands of the groin. But if the sore be in the course of the distribution of the ulnar nerve, there are small glands a little above the internal condyle which may previously swell. It is from the mamma, the most frequent source of cancerous matter, that these axillary glands become so often diseased; and it is this disease of these glands chiefly which occasions the frequency of operations in the axilla, and gives importance to the anatomy of the part.

If, when these glands are not far advanced in the disease, only feeling through the integuments hard and enlarged, a small incision be made, there is danger of their eluding us, slipping amongst the loose cellular substance. They should be firmly fixed with the two fingers, so that when the incision is made, they may start out; and the fingers should not be removed from them, when small and moveable, until they are taken up by the assistant's hook.

When the glands become more enlarged, they form adhesions with the surrounding cellular membrane; they group together, and form a fixed indurated mass. Those marked fig. 1, for instance, will be clustered together.

There is at present under my care, a very deplorable case of schirrous glands in the axilla. The patient is a young woman. There is a general swelling of the left breast, unlike the schirrous mamma; but at one point the breast feels indurated; she has acute pain in the breast and shoulder; she has a degree of pain over all the arm, with a numbness and pricking of the palm of the hand and fingers. Upon a careless examination of the axilla, it is difficult to perceive any thing wrong; but on forcing the fingers very deep, I feel a large and fixed cluster of glands close upon the artery and nerves, lying betwixt them and the ribs, and by its pressure giving this numbness to the arm. When these glands inflame, become enlarged, and suppurate, such symptoms of numbness arise from the abscess compressing the nerves; and when the abscess heals, the indurated stool includes or presses upon the plexus of nerves. There is at present in the Edinburgh Hospital a young man, who has totally lost the power of motion and feeling in his arm, from a succession of abscesses in the arm-pit; and the nerves having been included in the inflamed mass, feel now like thick and firm cords.

Since those arteries which are passing through the glands are the same which proceed to supply the mamma, it might be thought, that if we were first to extirpate the axillary glands, we should not have to take up with the tenaculum the same arteries twice. But this is no object. The extirpation of the breast is a simple operation. If the breast be small, the arteries which bleed during the operation can be

stopped with the point of the assistant's finger. If it be large, they can be easily tied as they are cut; and in this case it is better to tie them when they first bleed; for being stopped by the finger, they do not bleed when the finger is lifted, and are with difficulty found; and if not found, bleed when the woman is laid to rest, and begins to recover from her apprehensions. The arteries which bleed in the extirpation of the breast, are those coming from the interstices of the three first ribs, viz. branches of the internal mammary (See Additional Plate VI, Vol. I), and those thoracic arteries which we see in this dissection coming round from the axilla.

But it is necessary to remember, that often in large tumours of the axillary glands, and when they penetrate deep and near to the axillary artery, as it would be madness to cut with the knife, so it would be fruitless to seek for the mouths of the arteries: After laying the integuments over, which cover the glands, fully open, they must be insulated, and torn away with the fingers; the gap left is deep, and full of coagulating blood, and our only resourse is the sponge. Two or three firmly compressed sponges, with ligatures attached, should be in readiness; the sponge is to be thrust into the axilla, another, if it should be required, and one or more compresses above it. The roller is applied round the breast and neck, and firmly upon the compresses in the axilla, and then the arm is bound down to the side. When the sponges come away, they leave a clean surface, which easily unites, or fills up.

When the glands do not lie deep in the arm-pit, the arteries may be secured by the tenaculum; but of all practices, the most dangerous is diving with the needle in this part; for you observe the proximity of the great arteries and nerves of the arm; yet it has happened, that the needle has been struck round the ulnar nerve (c), which was marked by the pain, the numbness and contraction of the ring-finger, and little finger. We see how imminent the danger was of striking through the axillary artery. It is indeed difficult to conceive how the one could be struck without the other; and as, in this case, there is an impossibilty of the ligature coming away, there is another danger in cutting it out.

FURTHER DISSECTION OF THE ARTERIES AND NERVES OF THE ARM.

Before proceeding to the farther description of the anatomy of the arm, I have given here a plan, or arrangement of the arteries and nerves of the arm, which, I believe, will more facilitate both the dissection and general recollection of their distribution, than a more elaborate description.

PLAN OF THE BRANCHES OF THE SUBCLAVIAN ARTERY.

FIRST PLAN.

1.	2.	3.	4.	5.
ARTERIA MAMMARIA INTERNA,	*ARTERIA THYROIDEA INFERIOR,*	*ARTERIA VERTEBRALIS,*	*ARTERIA INTERCOSTALIS SUPERIOR,*	*ARTERIA SUPRA-SCAPULARIS.*
passes upon the inside of the cartilages of the ribs, where they join the sternum, passes on to the rectus muscle, and inosculates with the epigastric. See Additional Plate V, Vol. I. It gives, in the thorax, the arteriæ thymicæ, arteriæ comes nervi phrenici, to the pericardium to the thymus.	opposed to the superior thyroid, a branch of the carotid; gives off *ramus thyroideus* to the gland and trachea, *thyroidea ascendens*, *transversalis colli*, sometimes the *transversalis humeri.*	passes into the cervical vertebra, to run incased in bone to the brain.	passes betwixt the two uppermost ribs; sometimes gives off a bronchial artery, also branches to the œsophagus, to the muscles of the back, and ascending twigs to the neck.	Sometimes this artery rises from the thyroid, under the name of transversalis humeri, passes behind the root of the mastoid muscle to the skin and muscles; passes through the supra-scapular notch, by some called dorsalis scapulæ superior.

N. B. The two cervical arteries are extremely irregular in their origin. The *arteria cervicalis profunda* is an artery which passes across the root of the neck, like the transversalis humeri. Sometimes it is derived from the subclavian artery; sometimes a branch of some of the arteries of the second order; often it is wanting.

The *cervicalis superficialis;* seldom a branch from the main artery, often from the thyroid artery; runs towards the shoulder, after distributing small twigs to the axillary plexus of nerves.

If the student learns these branches of the subclavian artery, and the branches of the external carotid artery at the angle of the jaw, he can have no farther difficulty with the arteries of the neck and head.

PLAN OF THE BRANCHES OF THE AXILLARY ARTERY.

ARTERIES to the BREAST, viz. distributed to the outside of the THORAX.

1. Arteria thoracica superior,
2. Arteria thoracica longior,* or external mammary,
3. Arteria thoracica axillaris.

ARTERIES to the SHOULDER, i. e. to the scapula and muscles surrounding the joint.

4. Arteria thoracica acromialis, being chiefly to the muscles of the shoulder,
   (Arteria transversalis humeri, from the thyroid artery, and a branch of the subclavian consequently.)
5. Arteria subscapularis,
6. Arteria circumflexa posterior,
   Arteria circumflexa anterior, the first branch of the axillary division of the artery.

SCHEME OF THE ARTERIES OF THE SCAPULA.

THE scapula has two great sources of arteries, viz. from the thyroid artery, or trunk of the subclavian, and from the subscapular artery coming off from the axillary artery.

FROM THE THYROID.	FROM THE SUBSCAPULARIS.
1. Cervicalis superficialis. †	1. Muscular branch.
2. Supra-scapularis. ‡	2. To the hollow of the scapula.
N. B. These supra scapular arteries inosculate upon the hollow surface of the scapula, under the head of the acromion process, and upon the base, or posterior edge, with	3. To the inferior costa, 4. The ascending artery of the base, or what should rather be the great coronary artery, 5. Great dorsal branch, inosculating freely with the supra-scapularis artery, under the infra-spinatus muscle.

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* I see the *thoracica longior* to the great pectoral muscle, the *thoracica acromialis*, and the *thoracica brevior* to the *lesser pectoral muscle*, sometimes coming off in one trunk, and branching at one point, like *axis arteriæ cæliaci*.

† The cervicalis superficialis, is often a branch from the trunk of the subclavian artery; it passes through the plexus of nerves, supplies them in its course, and passes on to the top of the shoulder; it is a less important branch.

‡ When this artery is derived from the thyroid artery, it must take a long course, and is called the *transversalis humeri*, or *ramus thyroideus scapularis*; when derived from the trunk of the *subclavian artery*, supra-scapular artery, in contradiction to the subscapular artery.

BRANCHES OF THE BRACHIAL ARTERY.

The brachial, or humeral artery, being that extent of the trunk betwixt the edge of the tendon of the pectoral muscle, and the bifurcation into the radical and ulnar arteries.

1, Anterior circumflex artery.

2, Lesser muscular branches.

3, The profunda humeri. *

4, Lesser muscular branches passing off on each side, and very generally a more considerable and long branch passing down parallel to the great branch of the profunda, viz.

5, Profunda minor, or inferior.

6, Anastamaticus major.

ARRANGEMENT AND GENERAL DISTRIBUTION OF THE NERVES OF THE ARM.

GENERAL ARRANGEMENT OF THE CERVICAL NERVES.

The FIRST, SECOND, and THIRD CERVICAL NERVES, may be described in a general way:

1, As distributed chiefly to the muscles of the back of the neck and occiput; while they send also branches forward to the intricate connections of the 6th, 7th, 8th, and 9th nerves of the cerebrum, under the angle of the jaw.

2, The third and fourth, and cervical nerves form the phrenic nerve †, which, crossing the neck obliquely inward, enters the thorax, and is distributed to the diaphragm.

3, The FOURTH, FIFTH, SIXTH, and SEVENTH, and first of the back, form the axillary plexus.

THE AXILLARY PLEXUS,

Or BRACHIAL PLEXUS, of NERVES, is formed by four cervical nerves, and one of the back. There are generally enumerated six great nerves proceeding from this plexus; and Veussens, Haller, Sabatier, and others, have tried, by an ill-directed labour, to disentangle the plexus, and to trace each nerve of the arm from the cervical nerves ‡. But it is evident, that plexus and ganglions are intended by nature to allow

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* The branches of the profunda lie chiefly behind the os humeri; it divides into three considerable branches; the larger one turns round the bone in a spiral course under the two longest heads of the triceps, and terminates in free inosculations upon the outer condyle, with the recurrens intercussi and radialis; the second, and least important branch of the profunda, goes to the long head of the triceps; the third passes more upon the inside of the arm, and towards the internal condyle.

† This is only a general arrangement connecting the nerves of the neck and axilla. The minute anatomy of these nerves is the subject of the succeeding Part.

‡ Thus, the *external cutaneous* from the fourth and fifth cervical; the *radial* from the sixth and seventh chiefly; the *ulnar* from the last of the neck, and first of the back; the *internal cutaneous* from the point of union of the first of the back, and last of the neck; the *circumflex* from the fourth and fifth pair of the neck; the *musculo-spiral* from the sixth of the neck, and indirectly from the fourth, fifth, and seventh: These are merely the general derivation, without mentioning the more intricate lesser connections.

of an universal communication and interchange of nerves. And these authors are attempting to make an artificial arrangement, which, were it for the facility of teaching, were allowable, but which, on the other hand, begets intricacies, and a total want of method. I would prefer this simple and natural arrangement as serving every useful purpose.

The nerves passing out from the brachial plexus are seven in number:

The SUPRA-SCAPULAR nerve; the ARTICULAR, or CIRCUMFLEX; the external cutaneous nerve; the INTERNAL CUTANEOUS NERVE; the RADIAL NERVE; the ULNAR NERVE; the MUSCULO-SPIRAL NERVE.

ARRANGEMENT.

There are thus two nerves to the shoulder and joint, viz. the supra-scapular and circumflex; two to the integuments, viz. the external and internal cutaneous nerves; two for the acute feeling of the fingers, viz. the radial and ulnar nerves; and one common to the muscles and integuments, viz. the musculo-spiral nerve.

NERVES TO THE SHOULDER.

The SUPRA-SCAPULAR NERVE.—This nerve makes the seventh in our arrangement; six only being enumerated formerly. It might be considered as a cervical nerve;* it passes down obliquely, and is but very slightly connected with the axillary plexus. This nerve then crosses the axilla at the highest part, passes above the joint, and through the notch of the scapula to the supra and infra-spinatus muscles.

The CIRCUMFLEX NERVE, or ARTICULARIS, or AXILLARIS,† passes from the back part of the plexus; sometimes it is a secondary branch from the radial nerve. It crosses the axilla, goes under the arm-bone, and follows the course of the circumflex artery, coming round to the outside of the arm.

NERVES TO THE SKIN.

EXTERNAL CUTANEOUS NERVE, or PERFORANS CASSERII. It comes off, as from the great radial nerve, to gain the outside of the arm; it takes a very peculiar passage through the coraco-brachialis muscle: Before its passage, it gives two descending branches, one to the muscle, and the other uniting with the radial nerve. After its passage, it sends a second communicating branch to the radial nerve. It continues its course obliquely across the arm, lying betwixt the biceps and brachialis internus muscle; it is then a superficial nerve, and runs down upon the supinator longus muscle, branching to the integuments, and accompanying the cephalic, the median cephalic, and veins upon the back of the thumb.

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* Or we may say, that the great inferior and anterior branch of the fourth cervical nerve first sends a twig to the branch of the third, forming the phrenic nerve; then it sends two branches to the fifth cervical nerve, or in other words, to the brachial plexus; and the third branch passes over the scapula, and is the supra-scapular nerve; or some describe it as derived from the third cervical, descending and forming a slight connection with the plexus, and then taking its course over the shoulder.

† There go off at the same time generally two branches, which, in opposition to the supra-scapular nerve, ought to be called the INFRA-SCAPULAR NERVES; these are distributed to the subscapular muscle, the teres major, and the latissimus dorsi. They form connections with branches of the intercostal nerves, which come through the intercostal muscles into the axilla. They are sometimes branches from the root of the circumflex nerve.

which runs down upon the radial edge of the fore-arm to the wrist. The trunk of the nerve descending, and taking a spiral turn, becomes chiefly a muscular nerve of the fore-arm, sending branches to the head of the supinator longus, the supinator brevis, the extensores carpi radiales longior et brevior. The main branch continues its course down the fore-arm, so as to turn amongst the extensor muscles upon the radial edge, while the larger branch, or what may be considered as the continued trunk, passes into the substance of the supinator brevis muscle. While the nerve is yet turning over the head of the radius, and lying under the supinator muscle, there is detached that remarkable cutaneous branch, which, turning under the extremity of the muscular part of the supinator longus, runs down superficially upon the radial edge of the fore-arm to the wrist, to be distributed to the back of the wrist, thumb, and fore-finger.* The branch which passes into the supinator brevis passes under the extensor muscles of the thumb and fingers, and terminates upon the ligaments of the carpus.

N. B. The names and arrangement of Winslow are exceedingly good; he found three great nerves passing to the fore-arm, viz. the radial, ulnar, and muscular spiral nerves; but he did not distinguish them by these names; but the muscular spiral, being that nerve which passes chiefly to the radial edge of the arm, he called the RADIAL; the ulnar he called the CUBITAL; and the radial passing in the middle of the arm, and betwixt these, he called the MEDIAN NERVE.

OF THE DISSECTION OF THE ARM.

We ought to draw our incision directly in the course of the biceps muscle, because there are here no delicate parts that can be cut. Dissecting off the integuments from the inside of the arm, we find a very delicate cutaneous nerve proceeding from the axilla, which must be avoided. This is not the internal cutaneous nerve, for it is included in a fascia, which extends up from the internal condyle of the humerus, and which covers the brachial artery, and the radial nerve, the ulnar nerve, and the continued trunk of the basilic vein. Some pretty strong slips of fascia are continued from the margin of the biceps muscle (it is particularly so in a strong man). Upon dissecting up the fascia, we find immediately under the inner margin of the biceps muscle, and running connected in the sheath of cellular membrane, first, the great radial nerve; under it the brachial artery; upon the inside of the brachial artery, the basilic vein; and upon the surface of the vein, and running parallel to these, the internal cutaneous nerve; further down, and on the edge of the triceps, we find the radial nerve running connected with that branch of the profunda which passes down upon the internal condyle.

If we follow down the internal cutaneous vein over the internal condyle, we shall find its branches, and the branches of the median and basilic veins connected in a layer of aponeurosis, distinct from the insertion of the biceps into the fascia of the fore-arm. Both here, where the fascia binds down the muscles of the fore-arm, and on other parts of the body where there are strong fascia, as on the thigh, these veins are not quite superficial and unsupported, but lie in a sheath of condensed cellular membrane.

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* I see, in late authors, a confusion betwixt the superficial branch (which passes off where the trunk is lying, betwixt the supinator longus, heads of the extensores carpi radiales, and the brachialis internus, and which passes down to the wrist), and that larger branch which turns out from under the supinator longus farther down upon the arm, and which passes to the back of the thumb, fore-finger, and wrist.

The INTERNAL CUTANEOUS NERVE takes a superficial course upon the inside of the arm, in the line of the brachial artery; it may be considered as a branch, or secondary nerve from the ulnar nerve; it is the lowest nerve of the axilla; it divides upon the arm; it is distributed to the integuments on the inside of the fore-arm.

The SPIRAL MUSCULAR nerve might be arranged under the cutaneous nerves, or under that of the muscular branch, but it would confound the student.

NERVES IN THEIR FINAL DISTRIBUTION TO THE FINGERS.

The RADIAL NERVE.—This is the great nerve of the hand and fingers; it descends with the brachial artery, and is protected by the margin of the biceps. In its progress it gives no branches until it has reached the bifurcation of the artery, and sunk under the expansion of the biceps; here it distributes many branches to the muscles of the fore-arm, to the pronator teres, the flexor carpi radialis sublimis, and profundus, and flexor muscles of the thumb, to the pronator quadratus, and twigs coursing alongst the interosseous ligament.* These lesser muscular twigs proceed in general from three or four larger branches of the trunk. The continued nerve lies betwixt the flexor digitorum sublimis and profundus; as it proceeds towards the wrist, it gets more superficial, lying in the middle of the wrist, and amongst the tendons; as the radial artery sends of a superficial branch to the wrist and palm, so the nerve, before it descends under the ligament of the wrist, sends out a superficial branch to the integuments and short muscles of the thumb; under the ligament of the wrist, and in the palm, it divides, sending branches to the thumb, fore, and middle finger, and one side of the ring-finger. The description of its more minute distribution to the several muscles of the fingers, would be improper here.

The ULNAR NERVE, in its course upon the inside of the arm, gives out no branches, until it is about to turn behind the internal condyle, when it gives twigs to the triceps and integuments; after passing the elbow-joint, it gives some twigs to the joint, but descends to the fore-arm in two great branches, which, in their course, supply the muscles. The division of the ulnar nerve is near the elbow; but the branches continue together till near the wrist; one of them passes to the back of the hand, by slipping under the flexor ulnaris; turning round the ulna, it gives branches to the back of the carpus, to the ligament, and to the little and ring-fingers. The CONTINUED TRUNK unites itself with the ulnar artery, and lies under the edge of the flexor ulnaris, it passes by the side of the pisiform bone, and over the ligament of the wrist it divides then into three branches, one of which passes deep, and under the flexor tendons of the fingers and lumbricales muscles; the other two are more superficial, and pass to the little and ring-fingers.

The MUSCULAR SPIRAL NERVE.—This nerve, you cannot forget, passes behind the humerus, while the muscular cutaneous passes before the bone; this passes betwixt the long and the second head of the triceps, while the muscular cutaneous perforates the coraco-brachialis muscle. Before it perforates the muscles, it sends a superficial branch downwards upon the inside of the arm; it sends nerves to the several portions of the triceps; passing behind the bone, it appears again at the head of the supinator longus; it descends betwixt this muscle and the brachialis internus; it here sends of a long cutaneous branch,

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* Or we call this the interosseous nerve, which follows the course and distribution of the interosseous artery, which supplies the flexor longus policis, and the flexor digitorum profundus, and pronator quadratus.

EXPLANATION OF PLATE II.

BONES AND MUSCLES.

A, Part of the PECTORALIS MAJOR MUSCLE, held out by a cord.

B, The PECTORALIS MINOR MUSCLE.

C, The CLAVICLE.

D, D, D, The RIBS.

E, The LATISSIMUS DORSI, where it passes off from the back, to form with the pectoralis major the axilla.

F, The DELTOID MUSCLE.

G, The BICEPS FLEXOR CUBITI.

H, The TRICEPS EXTENSOR CUBITI.

I, The CORACO-BRACHIALIS MUSCLE.

K, The BRACHIALIS INTERNUS MUSCLE.

L, The round tendon of the biceps passing to be inserted into the tubercle of the radius.

M, The expansion of the biceps into the fascia of the fore-arm, or its connection with the general fascia of the fore-arm.

N, The INTERNAL CONDYLE of the humerus.

O, The PRONATOR TERES muscle.

P, The FLEXOR SUBLIMIS.

Q, The FLEXOR PROFUNDUS.

R, The SUPINATOR LONGUS.

S, The EXTENSOR CARPI RADIALIS LONGIOR.

T, The EXTENSORS of the THUMB.

V, The ABDUCTOR of the FORE-FINGER.

ARTERIES.

a, The SUBCLAVIAN ARTERY.

b, The AXILLARY ARTERY, where it is about to be involved in the brachial plexus of nerves. THE BRANCHES OF THE AXILLARY ARTERY ARE THESE:

c, The supra-scapular artery.

d, d, e, f, The thoracic arteries, being those branches of the axillary artery which go to the breast, and muscles lying on the breast; the uppermost of those four branches, e, is the ramus acromialis, and f is the thoracica longior, or EXTERNAL MAMMARY ARTERY.

g, The INFERIOR SCAPULAR ARTERY. It is seen dividing into two large branches; one,

h, The POSTERIOR CIRCUMFLEX ARTERY.

i, The PROPER SUBSCAPULAR ARTERY, which is sometimes a distinct branch of the axillary artery.

k, The ANTERIOR CIRCUMFLEX ARTERY.

*** The BRACHIAL ARTERY in its whole length.


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Plate III.

I, A branch to the heads of the triceps muscle, and also to the cellular membrane of the hollow of the axilla.*

m, The profunda humeri. It sends its chief branches round the arm-bone to the muscular bellies of the triceps extensor; it is distributed in general, therefore, to the back part of the arm.

n, A considerable branch of the superior profunda, which extends to the internal condyle of the humerus, inosculating round the joint, as the external branches of this artery do with the recurrent branches of the ulnar, radial, and interosseous arteries.

o, The lesser, or inferior profunda, which runs down in company with the ulnar nerve towards the inner condyle.

p, A more considerable branch from the trunk of the brachial artery to the belly of the biceps, and to the coraco-brachialis muscle; but the artery is in its whole course here giving continually off muscular branches, viz. to the biceps, to the triceps, to the coraco-brachialis, and brachialis internus muscles. These branches have in general a tendency downwards; and some of them extend their extreme branches to the joint, and inosculate round it with the reflected branches of the arteries of the fore-arm; more particularly that marked

q, Is the ramus anastomaticus major. This is the artery which is enlarged in the tying of the trunk of the brachial artery, at the bend of the arm.

r, The trunk of the brachial, or humeral artery, where it passes under the expansion of the biceps muscle; here it sinks into an axilla-like hollow, betwixt the pronator teres and the flexor muscles of the wrist and fingers on the one side, and the supinator longus, and extensor muscles on the other.

s, The ULNAR ARTERY, which, from its direction, seems to be the continued trunk.

t, The RADIAL ARTERY.

x, The RECURRENS ULNARIS.

y, The continued trunk of the ULNAR ARTERY. It takes its course deep amongst the muscles of the fore-arm; it lies in the connecting cellular membrane of the flexor digitorum profundus, and sublimis; but towards the wrist, it gets from under the tendons of the sublimis, and is covered only by the general fascia. See the annexed marginal plate.

z, The INTEROSSEOUS ARTERY,† which takes its course close to the interosseous ligament.

1, The RECURRENS RADIALIS. It divides into a more superficial, and a deep-seated branch, or sometimes these come off separately.

2, At this point of the artery, generally a number of strong muscular branches pass off to the extensor muscles, and the supinator longus. In the whole course of the radial artery, muscular branches are seen passing off,

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* I have repeatedly observed what is in the subject now before me, while I write, that the long thoracic artery has taken its origin from this point, the beginning of the brachial artery; it then passes rather as a cutaneous branch by the margin of the pectoral muscle, and is extensively distributed on the breast.

† Soon after it comes off from the ulnar artery, it sends a great branch through betwixt the heads of the bones. This branch runs on the outside of the ligament, and betwixt the extensor muscles of the fingers, and the muscles of the thumb, and is the external interosseous artery. The main artery lying on the inside of the ligament, takes its course under the pronator quadratus, when it continues its extreme branches over the bones of the carpus, and inosculates with the palmar arches. In all this course, the interosseous artery is supplying the deep-seated muscles, and nutritious arteries of the bones of the fore-arm; but near the wrist, it sends through a branch betwixt the radius and ulna, which continues its course over the bones, or the carpus and metacarpus. It is these arteries, the wounds of which are so often complicated with deep wounds and fracture of the bones, when, as frequently happens in duels, the ball rakes along the fore-arm.

3, The RADIAL ARTERY, where it is to be felt pulsating betwixt the fingers and the radius. Here it lies much exposed, and is frequently cut.

21, The ramus volaris, or superficialis volæ.—While the main artery goes to the back of the hand, passing under the extensor tendons of the thumb, this runs superficially over the wrist towards the palm. Sometimes it is small, and distributed chiefly on the ligaments; sometimes it perforates the abductor muscle of the thumb, and inosculates with the superficial palmar arch. In some arms it is as large as the trunk, and forms a complete circle of large inosculations round the thumb; from its size, this artery, when wounded in the wrist, bleeds most furiously, so that the wound may be mistaken for a wound of the radial artery itself.

4, The CONTINUATION of the RADIAL ARTERY, where it turns from the fore-part of the wrist, under the three extensor tendons of the thumb.

5, The ARTERIA DORSALIS CARPI.—This branch, distributed upon the carpal bones, and under the tendons, forms free inosculation with the interosseous artery of the fore-arm; it forms the little interosseous arteries of the metacarpal bones supplying the interosseous muscles; of these branches, that which passes betwixt the metacarpal bones of the middle and fore-fingers is more considerable, forming an inosculation with the branch of the palmar arch to the fore and middle finger.

6, The ARTERIA DORSALIS POLICIS.

7, The RAMUS INDICIS, or arteria radialis indicis.

8, The course of the ARTERIA MAGNA POLICIS, indicated by a dotted line. A branch is seen passing to the fore-finger. The deep artery of the palm, the arteria palmaris profunda, is to be considered as the continued extremity of the radial artery; it turns round the root of the thumb into the palm, and, lying betwixt the tendons of the fingers, and the heads of the metacarpal bones, forms a deep arch, which inosculates with the ulnar artery, while, it may be recollected, that the branches of the great artery of the thumb inosculate with the superficial, or greater arch of the palm.

N. B. The course of the ulnar artery, and the anatomy of the palm of the hand, is to be followed in the annexed marginal plate.

NERVES.

9, 9, 9, The mass of the BRACHIAL PLEXUS of NERVES.

10, The SUPRA-SCAPULAR NERVE.

11, The CIRCUMFLEX NERVE, or articular nerve.—It passes round the head of the humerus, and the tendons of the teres major, and latissimus dorsi; it passes alongst with the posterior circumflex artery (h), and is distributed to the teretes muscles, and to the capsule and deltoid muscle.

The SUBSCAPULAR NERVES to the subscapular and teres muscles, come off alongst with

12, The INTERNAL CUTANEOUS NERVE.—It is held out from its natural course upon the arm: The general tendency of its branches are shewn here, but more particularly in the last Plate.

13, The EXTERNAL CUTANEOUS NERVE, or PERFORANS CASSERII, or MUSCULO CUTANEUS, where it is passing into the coraco-brachialis muscle.

14, The perforans casserii, after it has passed through the coraco-brachialis muscle,* where it

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* There is in some subjects a communication from this point to the radial nerve, as large as the trunk, but in general it is a mere twig. This nerve, in passing the coraco-brachialis muscle, gives nerves to it; and from the substance of the muscle also, it sends a twig to the radial nerve. In its farther course betwixt the biceps and brachialis internus muscles, it gives branches to these muscles; it then runs down superficially alongst the external margin of the supinator longus.

lies under the biceps muscle. In the next Plate, at 24, it is seen held out by a thread, where it comes from under the belly of the biceps, and by the side of the supinator longus muscles to become a superficial or cutaneous nerve.

15, 15, A branch of the external cutaneous nerve.

16, The muscular spiral nerve, or the radial of Winslow.—It is seen here taking a turn under, or behind the bone, while the last nerve passes before it. Before it passes betwixt the bone and the triceps muscle, it is seen to send down a superficial twig alongst with the lesser profunda, and which forms communications with the internal cutaneous nerve. It sends off muscular branches in its passage.

17, The muscular spiral nerve, after it has passed in a spiral direction round the arm-bone; it has already given off branches to the supinator longus; it has also given off the long cutaneous branch 18; here it passes deep, distributed amongst the muscles of the fore-arm. It is from its situation here, upon the radial edge of the arm, that Winslow calls this the radial nerve; whilst the next, which is the radial nerve, he calls the median, from lying in the middle of the arm, and betwixt his radial, and that which is the ulnar, but which he calls the cubital nerve.

18, The prolonged cutaneous branch of the muscular spiral, distributed to the thumb, fore-finger, back of the hand, and wrist.

19, The RADIAL NERVE, where it lies connected with the brachial artery.

20, The RADIAL NERVE descending deep under the muscles of the fore-arm; from this point, until it appears more superficially (as in the annexed marginal Plate) at the wrist; it lies betwixt the flexor digitorum sublimis, and the flexor profundus.

EXPLANATION OF THE MARGINAL PLATE.

THIS was merely a hasty sketch which I took from a dissection by one of my private pupils. It is intended only to recal to the student's mind the chief points of the anatomy which are necessary in a surgical view.* He ought to recollect, in the first place, the palmar aponeurosis, the expansion which covers the palm of the hand; it is derived from the expansion of no muscle; it is connected at the wrist with the ligamentum carpi annulari (B), expands over all the palm of the hand, and splitting, to transmit the tendons of the fingers, it is infixed into the roots of the fingers. This tendinous expansion has two muscles connected with it; the PALMARIS LONGUS, which is a delicate muscle arising from the internal condyle of the humerus, and which is inserted into the ligamentum carpi annulare and this aponeurosis palmaris, and the PALMARIS BREVIS, which is best expressed by the term of Winslow, *palmaris cutaneus;* for it rises from the side of this aponeurosis, and is inserted into the integuments on the outside of the palm of the hand. When this tendinous expansion is dissected up, the parts appear as represented in this marginal Plate.

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* The palm of the hand, and the distribution of the arteries and nerves of the hand, form an important piece of anatomy, which the author hopes to be able to illustrate minutely by a succession of accurate and finished engravings.

A, The pisiform bone.

B, The ligament of the wrist.

C, The tendon of the FLEXOR CARPI ULNARIS.

D, The tendon of the FLEXOR CARPI RADIALIS.

E, The tendon of the PALMARIS LONGUS.

F, The FLEXOR DIGITORUM COMMUNIS.

G, G, G, G, The tendons of the flexor muscles of the fingers.

H, H, The sheaths of these tendons.

I, The abductor, the opponens flexor, and adductor policis, forming the ball of the thumb.

K, The abductor primi digiti.

L, ABDUCTOR MINIMI DIGITI.

1, The radial artery, where the pulse is felt; where it is turning from the fore-part of the wrist.

2, The ARTERIA SUPERFICIALIS VOLÆ.

3, The ulnar artery, where it is extricating itself from the muscles of the fore-arm.

4, The ulnar artery, where it lies superficially, and turns over the ligament of the wrist to form the great arch of the palm.*

5, Great palmar arch, which lies under the palmar aponeurosis, but above the tendons of the fingers; it is therefore improperly called *arcus subcutaneus*.

6, Inosculation of the termination of the ulnar artery with the radial artery.

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* The lesser, or deep-seated arch of the palm, lies under the tendons, and close to the bones, formed chiefly by the extremity of the radial nerve, which turns under the root of the thumb; while the other extremity of the arch forms a communication with the ulnar artery.

7, The RAMUS POLICIS ULNARIS.

The branches of the superficial arch, and their subdivision to the fingers, is sufficiently distinct without a reference.

8, The RADIAL NERVE, lying amongst the tendons of the flexor muscles, sufficiently removed from the great arteries.

9, Branches of the radial nerve to the thumb.

10, 10, 10, The further distribution of the radial nerve to the fore, middle, and ring fingers.

11, The ULNAR NERVE, lying close to the artery, and passing with it over the ligament of the wrist.

12, The distribution of the ulnar nerve to the ring and little finger. *

REMARKS UPON THE FULL DISSECTION OF THE ARTERIES AND NERVES OF THE ARM AND FORE-ARM.

THE place of the wound of the brachial artery in bleeding, was long misunderstood; and we find the best anatomists arguing the propriety of operating for aneurism here, not from the probability of the collateral arteries being sufficient to carry on the circulation, but on account of the probability of only one of the branches being wounded. Having the parts now before us, we see, that in the natural distribution of the arteries, by transfixing the median basilic vein, we should wound the trunk of the brachial artery a full inch above the bifurcation into the radial and ulnar arteries.

OF THE VARIETY OF THE DISTRIBUTION IN THE BRACHIAL ARTERY.—But the confusion on this point had arisen from the frequent irregularities of the distribution of the brachial artery; very frequently the artery does not descend in one trunk under the fascia of the fore-arm; on the contrary, it sometimes divides into the two arteries of the fore-arm, even in the axilla; in which case they run parallel, the radial branch taking a spiral turn round the other, and, instead of dipping deep under the expanded tendon of the biceps muscle, and under the protection of the muscles, it takes a superficial course upon the fore-arm; sometimes the brachial artery divides in the middle of the arm, sometimes near to the edge of the expansion of the biceps: When the radial artery runs thus superficially, it lies sometimes above the fascia, and immediately under the cutaneous veins; but still it is tied down by the crossing fibres of the fascia, appearing rather as if included in it than running above it.

This distribution of the arteries is to us no motive for the operation; it does not come into our calculation; we operate with the expectation of the trunk being wounded; but we have to attend to the PROBABLE CONSEQUENCES of a WOUND of THIS SUPERFICIAL RADIAL BRANCH. It lies superficially, so as even in the living body to be traced by its pulsation evident to the eye. The trunk of the brachial artery can be hurt only by so rude a wound as to have pierced the fascia; but here the artery lies in immediate contact with the vein, and may be touched even in a delicately performed operation. † We have no

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* It divides here into three principal branches; one passing into the palm, under the tendons, very deep; one to the ring and little finger, lying under the aponeurosis; and one which is seen upon the edge of the palm to the little finger, and which, of course, is not covered by the palmer aponeurosis.

† Yet it is not in every subject having this distribution of the artery, that we find it so entirely superficial, for generally it is fairly covered with the expansion of the biceps muscle, and it has always shreds of fibres binding it down.

cases of the wound of this branch on record; such a wound might, more than the pricking of the deep artery, be apt to form the aneurismal varix. At all events we see this artery above the fascia; we are therefore not to expect so regular a tumor with the fascia of the fore-arm forming the sac; the tumor will be more extensive; perhaps a general echymosis will be the consequence, from the driving of the blood into the cellular membrane.

Of the arteries which surround the joint.—Those are what are called the collateral arteries; that is, the smaller branches which run parallel with the trunks. Those from the brachial artery are the extremities of the profunda, the lesser profunda, the anastomaticus major, and some lesser anastomosing branches. These lesser anastomosing branches either follow the direction and general course of the anastomaticus major, or pass towards the outside branching betwixt the biceps and brachialis internus muscles, and inosculate with the recurrens, radialis, or a branch of the main artery, which takes a retrograde course, and which is sent off immediately before the separation of the radial and ulnar arteries.

The branches of the arteries of the fore-arm which correspond with these, are, the recurrens radialis, the recurrens ulnaris anterior and posterior, the recurrens interrossea.

To make a dissection of these, we present the back of the arm; we must carefully dissect the muscular branches of the profunda superior from the flesh and tendon of the triceps; we find it sending down a branch upon the back of the external condyle, which forms a net-work of vessels on the ligaments, and which chiefly communicates with the recurrens interossea. The profunda inferior, being a smaller and more superficial branch, comes down upon the inner edge of the triceps, turns over the back of the internal condyle, inosculates with the profunda major, and with the recurrens ulnaris posterior. The anastomaticus major turns likewise round the projecting bone, but does not keep its course upon the back part of the arm; it again turns to the fore part, and inosculates with the recurrens ulnaris anterior.

The retrograde branches of the arteries of the fore-arm seen upon the back part, are, the recurrens interossea and the recurrens ulnaris posterior. The recurrens interossea comes off from the interosseous artery; immediately after it has perforated the membrane, it ascends backwards to the joint, lying betwixt the ulna and the mass of the extensor muscles, as they arise from the outer condyle of the humerus. The recurrens ulnaris comes out from betwixt the heads of the flexor muscles.

All those arteries form a net-work of inosculations, which surround the elbow-joint, and which continue the circulation in the fore-arm, when the main artery, at the bend of the arm, is tied in the operation for aneurism. This may be so in the beginning, but it is not so in the end; for those arteries do not all continue to be enlarged; on the contrary, some one of superior size, or more direct communication, takes the lead, enlarges, becomes tortuous, and seems to annihilate others. As far as my observation goes, this is the business of the anastomosis, betwixt that branch of the brachial artery, which is called the anastomaticus major, and the recurrens anterior ulnaris. This artery becomes wonderfully enlarged, and is felt pulsating strongly behind the inner condyle soon after the operation.

Of the ulnar and radial arteries at the wrist.—There is no part of the body in which it is more necessary to connect the anatomy with the accidents, than here at the wrist; for, from apparently slight accidental wounds of these arteries, there come great pain, inflammation, deep driving of the blood, unskilful operations, and bad surgery, and danger of losing the arm, and even the life of the patient. The danger is from these vessels,—the ulnar artery, as it turns over the wrist, and the radial artery, as it turns over the root of the thumb, or the palmar arch in the hand not being neatly tied at first.

In a wound in the palm, we put in a large pad, or compress, and close the hand, and bind it firmly; but if the arch of the palm be cut, this does not completely stem the blood, or the pain and inflammation are such, as will not allow the bandage to be drawn sufficiently tight; we must then undo the band-

age, and endeavour to find the artery; but the appearance of the wound is changed; it is tumid, swelled by inflammation, and the extravasation of blood, so that, from the confusion of the wound, we probably cannot see the mouth of the artery. In this state of things, the patient getting weak from loss of blood, and the vessels perversely bleeding only when the dressings are applied, and stopping when they are undone, the surgeon is tempted to follow the artery with incisions, fruitless perhaps, because he is still amongst the disordered parts; he is at last tempted to dive for the roots of those vessels with his needle. And now let us observe the consequence of this: Suppose that a surgeon does not dissect neatly for the radial or ulnar artery at the wrist, but plunges for it with his needle, the skin, tendons, and nerves, are included, and the ligature is drawn tight upon them; there may be most dangerous nervous symptoms from the including of the nerve, and contraction of the fingers, or, more certainly, the next day, by the fading of the parts, the ligature slackens, and the artery bleeds again.

When the student, then, is studying this part of the anatomy, let him not run with too much rapidity over this important lesson. I would recommend it to him to read Mr. John Bell's Principles of Surgery upon this point, where he will find surgical cases so pictured and represented to him, that he will not quickly forget them; let him return then again to his subject; let him examine the fascia at this forepart of the wrist, and the manner in which it covers the artery; let him observe the palmar aponeurosis, and mark accurately the place at which the arteries turn over the wrist; let him mark the connection of the ulnar artery and nerve, where they lie connected, and observe the radial nerve free from the arteries, passing under the ligament of the wrist, and then he will not be guilty of seeking (as I have seen surgeons do) the radial nerve, in order to separate it from the radial artery.

EXPLANATION OF PLATE III.

MUSCLES.

A, The PECTORALIS MAJOR MUSCLE, raised from its origin from the ribs, and held back to show the distribution of the external mammary artery.

B, The tendon of the pectoralis major muscle, where it is about to be inserted into the arm-bone.

C, The DELTOID MUSCLE.

D, The PECTORALIS MINOR MUSCLE, arising from the third, fourth, and fifth ribs, and inserted into the coracoid process of the scapula.

E, The SERRATUS MAJOR ANTICUS. It arises from the nine uppermost ribs, and is inserted into the base of the scapula.

F, The SUBSCAPULAR MUSCLE.

G, The TERES MAJOR.

H, The BICEPS FLEXOR CUBITI.

I, The BRACHIALIS INTERNUS.

K, The TRICEPS EXTENSOR CUBITI.

L, The aponeurosis of the biceps muscle. It may be considered as derived from the broad tendon of the biceps; from which, spreading over all the fore-arm, it incloses the flexor muscles in a sheath; or we may more correctly consider it as a sheath of fascia investing the fore-arm, having strong origin from the points of bone, particularly from

(M), The internal condyle; in which case, this expansion of the biceps tendon is only a slip of communication, or an insertion into the general fascia of the fore-arm.

N, The SUPINATOR LONGUS.

O, The TENDON of the FLEXOR CARPI RADIALIS.

P, The TENDON of the FLEXOR CARPI ULNARIS.

Q, The TENDON of the PALMARIS LONGUS. The muscles of the fore-arm are still invested with their fascia; they are consequently not dissected.

R, Part of the LIGAMENT of the wrist.

S, The PALMARIS BREVIS MUSCLE. That which is held out by the pin is the vestige of the palmar aponeurosis, which spreads over the palm of the hand, covering the palmar arch of arteries and the nerves to the fingers.

T, The ABDUCTOR POLICIS.

X, The OPPONENS POLICIS.

Y, The ADDUCTOR POLICIS.

a, The FLEXOR MINIMI DIGITI.

b, The ABDUCTOR MINIMI DIGITI.

OF THE ARTERIES.

1, The EXTERNAL MAMMARY ARTERY, lifted up, attached to the pectoral muscle. It rises from the axillary by the upper edge of the pectoralis minor muscle; in its natural situation it lies betwixt these two muscles.

2, The SUBSCAPULAR ARTERY, before sending off the posterior circumflex artery.

3, The great muscular branch.

4, The BRACHIAL ARTERY, almost surrounded with veins and nerves, viz. the basilic vein, and venæ comites. The artery takes here a tortuous course, to accommodate itself to the injected veins.

5, The BRACHIAL ARTERY, where it is about to pass under the fascia. The fascia here is a good deal dissected, and cut trim; and the cellular membrane, in which the artery and deep-seated veins lie, is dissected away.

6, The RADIAL ARTERY, where it is becoming more superficial. Following its course to the wrist, we see its tortuous shape, which, with its superficial seat, gives the very evident pulsation of the wrist.

7, The ULNAR ARTERY, before it turns by the side of the pisiform bone to pass under the annular ligament of the wrist.

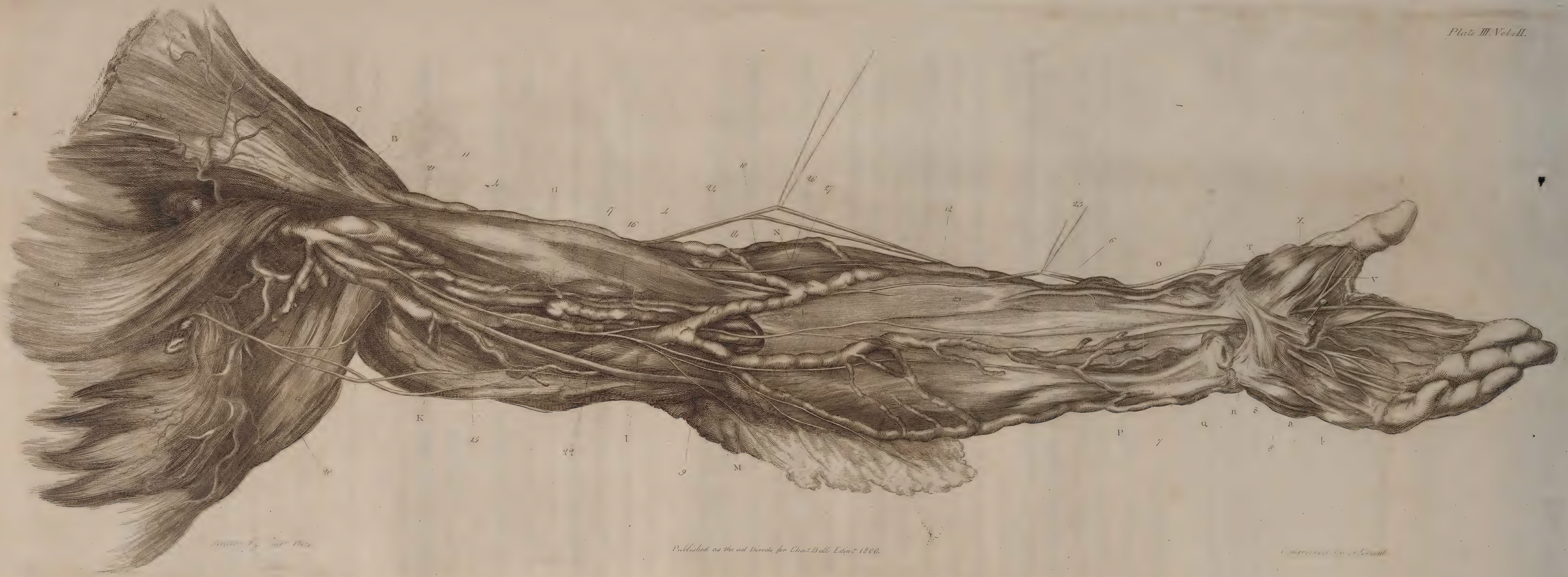
8, The ULNAR ARTERY, where it has arrived in the palm of the hand, and is forming the GREAT PALMAR ARCH.

OF THE VEINS.

9, The BASILIC VEIN. The source of this vein is from the lower part of the arm, and the back of the hand; its course is irregular. In many subjects, this vein, and the median basilic, are the only considerable cutaneous veins; the cephalic, and median cephalic, being very small.

10, The CEPHALIC VEIN. It is but partially seen here, where it is coming round from the back of the arm and wrist; the large veins upon the back of the hand joining, part again, and form the beginning of these two great veins, the basilic and cephalic; the basilic vein being that which turns obliquely round upon the lower part of the fore-arm, and upon the flexor muscles; the cephalic vein turns again over the supinator muscles.

11, The continued trunk of the cephalic vein, where it is passing upwards upon the outside of the biceps, and betwixt the deltoid and pectoral muscles, to terminate in the great axillary vein.



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12, The MEDIAN VEIN was in this subject rather irregular. The median vein takes a middle course betwixt the basilic and cephalic veins, lying upon the flat part of the fore-arm; as it passes upwards on the fascia, towards the bend of the arm, it divides into two branches, the one passing to the basilic, the other joining the cephalic vein.

13, The MEDIAN BASILIC VEIN; that in which we bleed; lying immediately over the artery 5.

14, The MEDIAN CEPHALIC VEIN; which is avoided in bleeding, because of the number of the superficial branches of the external cutaneous nerve.

15, The great trunk of the basilic vein, continued parallel to the artery, and forming in the end the great axillary vein.

16, 17, The two venæ comites; those which are formed by the branches of veins which accompany the arteries in their deep course amongst the muscles. These may be observed to have frequent communications with the larger cutaneous veins.

18, 19, The union of all these veins, with those also which accompany the circumflex and profunda arteries, to form the great subclavian vein.

These veins of the fore-arm are very irregular; sometimes branches of the basilic, sometimes branches of the cephalic vein, take the direction of the middle of the arm towards the wrist; in which case, the two median branches of the bend of the arm are irregular; and very often the median cephalic (14), is not derived from the median vein, but is a large branch of communication between those veins which lie under the fascia, and the great cephalic vein lying on the outside of the arm; and not unfrequently there is a confused network of veins covering all the fore-arm, from which we can count no regular derivation of the four great veins of the bend of the arm.

NERVES.

20, The UPPER INTERNAL CUTANEOUS NERVE, or the cutaneous nerve of the arm; while the proper internal cutaneous nerve belongs to the fore-arm.

21, The RADIAL NERVE passing under the protection of the margin of the biceps muscle, and closely connected with the brachial artery, and its accompanying veins.

N. B. The ULNAR NERVE has here no letter of reference; it is seen passing more towards the triceps muscle, accompanied by the profunda artery and vein, and passing behind the inner condyle.

22, The INTERNAL CUTANEOUS NERVE. It is seen to divide high; one branch passes more towards the internal condyle. This branch, in this subject, sends many branches over the great veins; but in general, the whole course of this internal cutaneous nerve, although superficial, is yet behind the greater veins, and betwixt them and the fascia. *

23, The distribution of a considerable branch of the last nerve, which takes a spiral turn under the median basilic vein, and which might be punctured by transfixing the vein in bleeding.

24, Cutaneous branches of the muscular-spiral nerve, which comes round from behind the arm-bone.

25, The continuation of the muscular-spiral nerve under the vein, which, in this subject, I have called the median, from the manner in which it sends off its communicating veins; but which is more generally a great branch of the cephalic vein.

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* While correcting this sheet for the press, I have compared the Plate with a minute class dissection; and I find innumerable smaller nerves passing over the median basilic vein, while the cephalic veins have comparatively very few. Still, however, it holds in general, that the median basilic vein has less connection with the cutaneous nerves than the median cephalic.

26, The branches of the EXTERNAL CUTANEOUS NERVE, coming out from betwixt the biceps and brachialis internus muscles; from this point there very frequently comes out a short cutaneous branch, which passes to the integuments immediately over the median basilic vein.

EXPLANATION OF PLATE IV.

BEING ADDITIONAL VIEWS OF THE ANATOMY OF THE BEND OF THE ARM.

FIG. I.

THIS is an example of the high bifurcation of the brachial artery; and it is intended chiefly to shew the course of the radial artery, and its relation to the expansion of the biceps muscle and the cutaneous veins.

A, The internal condyle of the humerus.

B, The muscles of the fore-arm covered with the fascia.

C, The SUPINATOR LONGUS.

D, The broad expansion of the biceps muscle inserted into the general fascia of the fore-arm.

E, The belly of the biceps muscle.

F, The integuments turned off from the inside of the arm.

1, The BRACHIAL ARTERY.

2, An artery, which, in this subject, had a very extensive distribution to the integuments of the breast, and the great pectoral muscle.

3, The MAIN ARTERY, or ULNAR ARTERY, after having sent off the radial artery; its course is under the margin of the biceps, and covered by the radial nerve and venæ comites.

4, The RADIAL ARTERY.

5, The PROFUNDA HUMERI, sent off from the back of the artery and the same point with the last.

6, The ULNAR ARTERY, before it passes under the expansion of the biceps muscle.

7, The more superficial course of the RADIAL ARTERY.

8, 8, The RADIAL NERVE towards the axilla; it is seen to be lifted a little from its place, to shew the branching of the artery more towards the bend of the arm; it is seen in its natural seat lying upon the arteries.

9, The radial artery lying under the expansion of the biceps muscle, but much more superficial than the main trunk in the natural distribution of the vessels; but sometimes it passes in this direction, covered only by one or two fibres of the fascia.

10, The continued course of the RADIAL ARTERY, superficially by the margin of the muscle.

11, An ARTERY derived from the ULNAR ARTERY; it takes the place of those branches which come from the radial artery in its natural distribution, and accounts sufficiently for the diminutive size of the radial artery in this distribution. We find that the ulnar artery keeps its superiority in size through all its course in the fore-arm and palm of the hand.

FIG. 2.

I was tempted to give an engraving of this dissection of the bend of the arm, in addition to the general view of the veins and nerves of the arm; because the veins were more regular, the dissection

Drawn by Charles Bell

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Engraved by I.s Grant

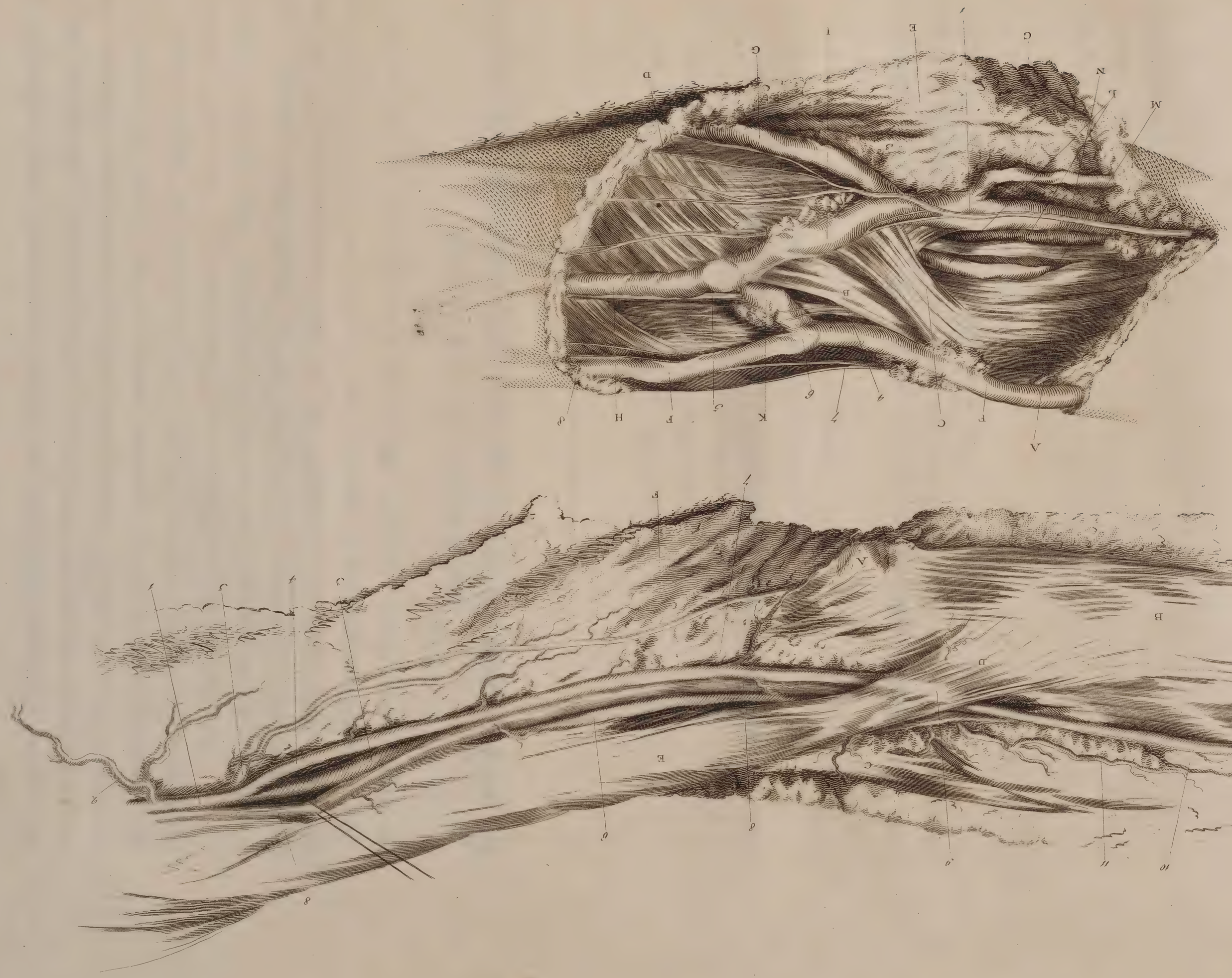

Plate IV. Vol. II.

more careful, and presenting exactly that distribution of the veins and nerves which I conceive to be the most common.

A, The BICEPS MUSCLE.

B, The EXPANSION of the biceps into the fascia of the fore-arm.

C, An APONEUROSIS coming off from the biceps, not so strong, but distinct from the proper expanded tendon of the biceps. All these I keep in a minute dissection.

D, The FASCIA covering the fore-arm.

E, The INTEGUMENTS.

F F, The CEPHALIC VEIN, which comes up upon the radial ridge of the fore-arm.

G, G, The BASILIC VEIN.

H, The MEDIAN VEIN.

I, The MEDIAN BASILIC VEIN.

K, The MEDIAN CEPHALIC VEIN.

L, The VENA COMES.

M, The BRACHIAL ARTERY.

N, The radial nerve.

1, The INTERNAL CUTANEOUS NERVE.

2, A branch of the internal cutaneous nerve, which passes under the median basilic vein.

3, A branch of the internal cutaneous nerve, which very generally passes over the union of the basilic and median basilic vein, to be extensively distributed over the fore-arm, and the chief branches of which accompany the basilic vein.

4, The trunk of the EXTERNAL CUTANEOUS NERVE.

5, A cutaneous branch running connected with the median vein.

6, Very remarkable twigs of the cutaneous nerve, which come out by the side of the tendon of the biceps, and pass to the integuments directly over the median cephalic vein.

7, The cutaneous branches of the MUSCULAR-SPIRAL NERVE.

8, Branches of this last nerve accompanying the cephalic vein.

SURGICAL REMARKS CONNECTED WITH THE SUPERFICIAL DISSECTION OF THE BEND OF THE ARM AND FORE-ARM.

LET the student, in the first place, mark well the connections of the cutaneous veins, and nerves, and fascia, and arteries; let him not confound, as some authors do, the description of deep-seated and superficial veins; let him note the extreme delicacy of these superficial nerves, and not think of looking for them in the midst of a bloody operation; let him not confound the symptoms of the injured nerves with the effect of straitened fascia; and, above all, it is important that he should consider the appearance of these parts in the aneurism of the brachial artery, and in other diseases which may affect them.

We see in the Plate, that the MEDIAN BASILIC VEIN, 13, is above the expansion of the biceps muscle, or the point at which the broad tendon of that muscle expands into the general fascia of the fore-arm. The edge of the fascia, where it is reflected towards the internal condyle (or perhaps we should say where it takes its origin from that bone), is here dissected away; its natural connection, which binds it down, and the vein, 13, is a very little removed from above the artery 5. But we find, upon examining the arm of the sub-

ject, that the artery (at the point where the vein crosses it obliquely), is covered by the fascia only; and that at this point it is thrown up more superficially by the bulging of the joint. *

With the parts before us, we can be at no loss to understand the peculiar appearance which the vein and fascia, when transfixed in bleeding, assume in forming the aneurismal tumor. By the firm compress and roller, the external wound, and that of the fascia, soon heals; but the artery continues to bleed, though not outwardly, the blood is impelled under the fascia; the connections of the fascia are torn up; a regular tumor is in time formed, occupying the bend of the arm; and this tumor stretching, the fascia contracts the fingers, and keeps the fore-arm at a right angle with the arm; as in other diseases in which the fascia is contracted, or the biceps muscle swelled or contracted, or the muscles under the fascia inflamed.

In the aneurism of the bend of the arm thus regularly formed, the first incision of the operation lays bare the fascia; for the integuments contract, and the glistening fascia appears forming the distended sac of the aneurism with the dark-coloured coagula under it.

Sometimes the aneurism takes a very different form, as the artery, when punctured by transfixing the vein, bleeds through the vein. It has thus happened, that the stream of blood has continued into the vein, and the parts inflaming and thickening round this communication, it has formed an established and permanent opening from the artery into the vein; while the outer wound of the vein healing, the proper ANEURISMAL VARIX is formed. In this case, the effect of the impulse of the arterial blood sent in upon the veins is, that, in the first place, the median basilic vein is raised into a tumor, and the other veins being also successively enlarged, the whole veins of the arm become varicose, and assume a very peculiar character. If we press the blood from the vein, we can feel the arterial blood rushing through the communication; it can be stopped by the point of the finger. Notwithstanding the very distinct characteristic marks of the aneurismal varix, I have heard surgeons boldly maintain, for their own honour, a common aneurism to be a case of aneurismal varix, though there was not a varicose or enlarged vein in the whole arm; and this merely because, in the commencement of the tumor, the blood could be forced back, or the tumor made to disappear; nay, even after the operation was performed, and the artery was seen lying in the bottom of the wound, fairly punctured crossways, they would maintain, that it had been an aneurismal varix, but that it had burst!

We may observe, that the internal cutaneous nerve passes down upon the inside of the fore-arm; but although its branches are very numerous, we see that they take, in general, a course under the veins; and we observe a very considerable branch taking a course directly under the median basilic vein. † The external cutaneous nerves, on the contrary, take more frequently a course over the veins. This, in bleeding in the median vein, makes the danger of puncturing the nerve much greater than when the operation is performed in the median basilic: in bleeding in the median basilic, on the contrary, there is more danger of wounding the artery. But with a delicate hand a wound of the artery is scarcely possible; while the most dexterous surgeon cannot be sure of avoiding the puncture of the nerve.

EFFECTS OF PUNCTURE OF THE NERVE.—When a nerve is wounded in bleeding, the patient feels a more acute pain than usual in that operation; has a sense of numbness communicated to the shoulder, and down to the fingers, or is disturbed and alarmed in a manner he cannot account for, and has a sense as of trilling of water down the arm. These, in the worst cases, are but preludes to a long train of miserable feelings,

---

* This superficial seat of the artery, and contiguity to the vein, causes the blood to flow from the vein per saltum; which circumstance has given a pale face to many a youth, conceiving it to be the blood leaping from a wound of the artery. This ceases upon bending the arm a little.

† This, or even the radial nerve itself, might be punctured by transfixing the vein.

spasm about the neck and jaw, frightful dreams, and a general loss of health from the extremely irritable state in which the patient is left for years after the accident. These spasmodic affections attack chiefly when the patient is going to sleep, when the system is exhausted. I have known a young man in this situation, that, when just falling asleep, his jaw was sometimes suddenly and violently clenched together, and a violent spasm of the muscles of the back, of the neck, and trunk, seized upon him, which did not leave him till he was again roused and awake; thus exhausting him with watching and fatigue. In this state of body, the slightest scratch, or ruffling of the skin, was attended with an aggravation of all the distressing symptoms. The complaint had existed for several years.

Another accident of bleeding is a swelling and inflammation of the puncture; an erysipelatous inflammation spreading all over the arm; a bad suppuration; a danger of gangrene. A bad suppuration, and a tendency to gangrene in a sore, I have observed to be a consequence of an injury of the nerves, or of the nerve being included in the ligatures.

The inflammation of the internal coat of the vein itself is also an alarming accident; but of this accident I am ignorant. Sometimes inflammation from bleeding, with successive suppuration and inflammation, extend under the fascia, or affect the fascia itself, or cause an obstinate hardening and contraction of the biceps muscle. In all these accidents, we are enabled, by observing the peculiar connection of the fascia, to understand the effect, and often to remedy the evil: From inflammation and abscess in the fore-arm, I have seen the most obstinate contractions in consequence of the newly-formed connection and thickening of the fascia, which, after the inflammation has subsided, I have cured with poultices, with camphor, and a splint laid alongst the fore-arm, padded, and adapted to the curvature, so as to keep the arm always gently on the stretch.

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A

SYSTEM

OF

DISSECTIONS;

EXPLAINING THE

ANATOMY OF THE HUMAN BODY,

THE

MANNER OF DISPLAYING THE PARTS, AND THEIR VARIETIES IN DISEASE.

VOLUME THE SECOND.

CONTAINING

THE DISSECTIONS OF THE ARM, OF THE NECK AND FACE, OF THE NERVOUS SYSTEM OF THE VISCERA, WITH A SHORT ACCOUNT OF THE MANNER OF DISSECTING THE BRAIN AND EYE.

WITH PLATES.

BY CHARLES BELL,

FELLOW OF THE ROYAL COLLEGE OF SURGEONS.

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1803.

SYSTEM OF DISSECTIONS.

PART II.

CONTAINING

THE DISSECTIONS OF THE SUPERFICIAL PARTS OF THE NECK AND FACE, WITH REMARKS CONNECTING THE ANATOMY AND SURGERY OF THE PARTS; A VIEW OF THE NERVOUS SYSTEM OF THE VISCERA; WITH A SHORT ACCOUNT OF THE MANNER OF DISSECTING THE BRAIN AND EYE.

SYSTEM

OF

DISSECTIONS.

OF THE DISSECTION

OF THE

SUPERFICIAL PARTS OF THE NECK AND FACE.

BEFORE the ſtudent proceeds to the diſſection of the neck and face, beſides having laid down certain important practical points to be the ſubject of his more particular attention during his progreſs, he ought to conſider, or endeavour to learn, what are the peculiarities to which his attention ſhould here be turned, and in what he is to expect this diſſection to differ from that of the arm or leg.

He will have learned that the extremities are covered with ſtrong faſcia, that their veſſels are protected by this faſcia, and ſtrong condenſed cellular membrane, which inveſts them. In the neck, however, he will find no ſuch faſcia, but only an extended web of muſcular fibres, which is ſtretched from the cheſt obliquely over the ſide of the neck to the cheek, and which, mingling with the common cellular membrane immediately under the ſkin, embraces and compreſſes the important veſſels beneath. He will, of courſe, inquire into the neceſſity and the effect of this peculiarity. It may, therefore, be obſerved, that the neck, having a great breadth or thickneſs in proportion to its length, the ſeveral parts are neceſſarily more upon the ſtretch in the various eaſy turns of the head; and that there is here an eaſe and variety of motions, which could not be allowed were the parts bound down by ſtrong facia *. Again, not only is there a neceſſity for free motion in the head and neck, but the

* When the neck is peculiarly ſhort, and when the fat depoſited ſtill further ſeparates the muſcles, then are the turning motions of the head impeded, and the ſtraining to the attempt has the effect of compreſſing the veins returning the blood from the head.

motions of the throat are ſo extenſive, that they could not have freedom, unleſs the uniform compreſſion (which is required to every part of the body) were yet ſo moderate as freely to relax, whilſt it kept a degree of tenſion on the parts.

Partly for theſe reaſons, and for the accompliſhment of other purpoſes which we ſhall preſently notice, the neck is not inveſted with a firm and unelaſtic faſcia, but with a cutaneous muſcle, the platyſma myoides.

This muſcle takes its origin, by diſtinct coarſe fibres, from the upper part of the cheſt, embodied with the cellular membrane which covers the deltoid muſcle and pectoralis major. Paſſing over the clavicle, to which they alſo adhere, theſe fibres form a muſcular expanſion on the ſide of the neck, and the muſcle aſcending takes hold of the ſide of the lower jaw, while ſome few fibres are continued into the muſcles of the face.

When the diſſector makes his inciſion down the middle of the throat, and careleſsly diſſects back the integuments, he is apt to lift back this cutaneous muſcle with them, becauſe where the muſcles of either ſide meet in the middle of the neck, the fibres are extremely thin, and confounded with the ſheath of cellular membrane which covers the veins and ſtraight muſcles. But, by taking little of the integuments off, except the cutis vera, and drawing his ſcalpel, in the length of the fibres from the clavicle to the chin, he will recogniſe the looſe fibres, and be able gradually, by a nice diſſection, to diſplay the ſuperficial anatomy of the neck, a moſt important part to the ſurgeon.

When you have diſſected back the integuments from the ſide of the neck, and behind the maſtoid muſcle, the connecting membrane becomes looſer, and here it is interwoven with the extremities of the cervical nerves, and their connection with the ſub-occipital and portio dura. There will be found here alſo numerous meſhes of veins, the occipital and cervical veins forming areolæ with the axillaris and jugularis externa.

On the throat too there are many ſuperficial ramifications of the external jugular vein, which inoſculate with the thyroid veins. Here alſo we find ſeveral delicate nerves, the branches of the anaſtomoticus colli deſcendens, and the extremities of the deſcending diviſion of the ninth pair, or deſcendens noni.

EXPLANATION OF PLATE V. VOL. II.

PARTS IN THE NECK.

A, The PLATYSMA MYOIDES, where it covers the external jugular vein.

B, A thread drawing out the cellular membrane, to which this thin web of muſcular fibres is attached.

C, It will be obſerved that here the edge of the muſcle is diſſected back a little where it covers the throat, and mingles with the cellular membrane covering the ſmaller veins.

D, We ſee that at this part the fibres of the platyſma myoides are continued ſmooth over the lower lobe of the parotid, mingling with the cellular membrane, a point to which the attention will be preſently called in a more particular manner.

E, The fibres, which being continued over the cheek into the angle of the mouth, with the depreſſor anguli oris, form the riſorius ſanctorini.

Cha.s Bell del.t

D. Lizars Sculp.t

F, The EXTERNAL JUGULAR VEIN which lies under the platyſma myoides, and almoſt involved in its fibres. We ſhall in general obſerve it to branch off ſomewhat below the angle of the jaw, and ſend one diviſion forward under the chin to the throat, and upwards on the face, while the other paſſes on before the ear, being joined by the occipital veins. Or there are two great external veins, one gathering the blood from the courſe of the facial artery, thyroid, and lingual arteries, the other returning the blood of the temporal and occipital arteries.

G, The OCCIPITAL VEINS. Theſe are paſſing down to unite with the external jugular vein juſt where it joins the axillary. They ſometimes join the axillary vein itſelf; ſometimes paſs into the vertebral veins. They have, at all events, free communications with thoſe veins.

H, VEINS which open into the thyroid veins.

I, NERVES, branches of the DESCENDENS NONI.

L, Branches of the cervical nerves, which unite with the deſcendens noni.

M, A branch of communication betwixt the third cervical nerve and the portio dura.

N N N, The ſecond, third, and fourth, cervical nerves.

OF THE PARTS SEEN ON THE FACE.

O, The great maſs of the PAROTID GLAND, lying before the ear.

P, The lobe of the gland which is below the ear, and lies deep betwixt the jaw bone and maſtoid proceſs.

Q, The ſocia parotidis.

R, The PAROTID DUCT, about to pierce the buccinator muſcle.

S, An expanſion of condenſed cellular membrane and fibres of the platyſma myoides, which being continued from the edge of the gland over the face, makes the anterior margin of the parotid undefined. It is here diſſected back.

T T, ORBICULARIS PALPEBRARUM.

U, LEVATOR LABII SUPERIORIS et ALÆ NASI.

V, LEVATOR LABII SUPERIORIS PROPRIUS.

X, LEVATOR ANGULI ORIS.

Y, ZIGOMATICUS.

Z, BUCCINATOR.

a, DEPRESSOR ANGULI ORIS.

b, Depreſſor labii inferioris proprius.

c, The FACIAL VEIN, or angularis.

d, The FACIAL ARTERY.

e, Branches of nerves from the portio dura of the ſeventh pair.

f, The infra-orbital nerve. It is ſeen to form connections with the laſt.

g, Branches of the portio dura aſcending upon the temple.

h, The frontal nerve.

HINTS WHICH MAY BE ATTENDED TO DURING THE SUPERFICIAL DISSECTION OF THE NECK AND FACE, AND TO WHICH, IN A PARTICULAR MANNER, THE SURGICAL STUDENT OUGHT TO ATTEND.

It very generally happens that the ſurgeon thinks he has done enough when he has learned to count the branches of the external carotid artery, and their connections with the glands; and, with theſe thoughts, he confidently undertakes all kind of operations on this part of the body. But I have ſo often ſeen, during an operation, miſtakes and heſitation, proceeding from ignorance of the outward appearance of the parts, and particularly from inattention to the effect of the platyſma myoides, that I feel myſelf called upon to ſolicit the ſtudent's attention to it.

In diſſecting out a ſmall ſuperficial tumor from the neck or cheek, we often find a few fibres encumbering us, and embracing the tumor with a firmneſs, which will readily be aſcribed to the fibres of the platyſma myoides, only by thoſe who recollect the wide difference betwixt the muſcle acting as a living part, and the relaxed and feeble ſtate in which it is found in diſſecting the dead body.

Again, I have ſeen ſurgeons experience much difficulty in diſſecting round the baſe of a tumor ſeated in the neck, or above the angle of the jaw, merely from forgetting the effect of this cutaneous muſcle in binding it down, and in more particularly connecting the baſe with the ſurrounding parts; for, thus miſled, he has to diſſect wide, deep, and irregularly, to deſtroy the adheſion of the tumor to the parts beneath. To diſſect out a diſeaſed gland, we ought to lay widely open the ſkin, cellular membrane, and fibres of this muſcle, and reach fairly down through the bed of fat or membrane in which it lies. By getting thus to the immediate ſurface of the tumor, which is generally ſmooth and uniform, the diſſection will in almoſt every inſtance be very eaſy; and often the gland may be turned out with the point of the thumb, or handle of the knife, ſo as to hang by its veſſels, the artery ſupplying the tumor being the only one which will require to be cut. By attending to this, it will be poſſible to diſſect tumors from parts ſurrounded with important veſſels, without hœmorrhage or other danger.

To profit by the diſſection before him, the ſtudent ought to conſider the ſubject of BRONCHOTOMY, and examine the anatomy of the fore part of the neck. With a view to this operation, let him obſerve the place of the great lobes of the thyroid gland, the iſthmus croſſing the trachea, and the thickneſs of the integuments over the trachea and the thyroid veins, and mark, ſo as to be able afterwards to calculate the diſtance of parts from the ſternum and pomum adami.

During his diſſection of the face alſo, the ſtudent ought to pay particular attention to the extent and relations of the glands, arteries, and parotid duct, and to the direction of the fibres, ſo as to make with preciſion and nicety ſuch little inciſions as may be neceſſary in practice.

In ſhort, to underſtand the importance of the deeper and more dangerous parts, it is neceſſary, at the ſame time, to ſtudy, with every poſſible attention, the more ſuperficial diſſection.

SECOND DISSECTION.

OF THE DISSECTION OF THE DEEPER PARTS OF THE NECK.

When the platyſma myoides is taken off, if the veins have been injected, we ſhall be aſtoniſhed with the irregularly dilated ſtate of the internal jugular vein; but we ſhall perceive that it is ſo in a particular manner, where it is under the influence of the deltoid and cutaneous muſcles, which, by their alternate and ſpaſmodic action, force the blood from the head into the thorax, during coughing or other violent inſpiration; and we may perceive that, without this proviſion, the blood would actually ſtagnate in the head while there were a ſtrain upon the lungs, and an interruption to the blood entering the cheſt. For the ſame reaſon (the occaſional difficulty of the return of the blood into the thorax), we ſee that even what may be conſidered as the cutaneous veins, are ſtill under the platyſma myoides. The effect of this muſcle on them may be at any time obſerved during the violence of a cough. This muſcle is, therefore, quite unlike the cutaneous muſcles of quadrupeds, and muſt not be claſſed with them. Neither is it a muſcle, the principal uſe of which is to pull down the corner of the mouth, or to act on the lower jaw; but its great effect is to compreſs the veins.

Bronchotomy here alſo forms the firſt ſubject to which the attention is naturally attracted in this diſſection. Obſerve the thickneſs of the integuments over the trachea, the veins which cover it, the ſmall muſcles which are to be held aſide: Obſerve alſo the extent of the thyroid gland, the profuſion of veins and arteries which ſupply it, the motion of the trachea, the rings of the trachea, the ſize of the paſſage of the tube, and that the ſpace for the operation is bound in by the carotids ſternum and thyroid gland. In ſhort, all thoſe circumſtances ought to be noted and obſerved, which have proved fatal during the operation, or which are by our beſt writers conceived to threaten ſuffocation, viz. the danger of blood falling into the wind-pipe, and cauſing ſuffocation; the motion of the throat throwing out the tube, and cauſing ſudden obſtruction, with the riſk of transfixing the trachea by the trochar, and the poſſibility of accidents from the ſwelling of the integuments, &c. Let the ſtudent make his mind up now to the difficulties, the dangers, and the uſes, of this operation; for when the call is made upon him, and his patient is in danger of immediate ſuffocation, the mind will not be free for deliberation.

The next ſtep of the diſſection will be to trace the trunk of the carotid artery, to diſſect nicely the ſheath which involves it, and to diſplay the manner in which the carotid artery and jugular vein lie included with the artery. And now having run over the branches of the external carotid upon the dry preparations, or in the book of the arteries, ſo as to know their arrangement and general courſe, the ſtudent, in his diſſections, ſhould attend accurately to their relations among the ſoft parts, and mark, and carefully retain in his memory, their bearings from the prominent points of the living ſubject. For example, the horn of the os hyoides, the maſtoid proceſs, the angle of the jaw, the lateral prominence of the atlas, the line of the maſtoid muſcle, &c.

During the diſſection, the connections of the ſalivary glands ſhould be attended to, with their ducts, and the arteries connected with them, and, in a particular manner, the lymphatic glands, the beds of cellular membrane in which they lie, and the veſſels which are endangered when theſe glands become enlarged and preſs upon the neighbouring parts.

EXPLANATION OF PLATE VI.

This ſketch repreſents the appearance which the parts in the neck and under the jaw preſent when firſt laid open, and before they are fully followed out.

A, The MASTOID MUSCLE diſſected looſe and laid a little back.

B, The STERNO-THYROIDEUS MUSCLE.

C, The STERNO-HYOIDEUS MUSCLE.

D, The OMO-HYOIDEUS MUSCLE.

E, The STYLO-HYOIDEUS MUSCLE.

F, The DIGASTRICUS, or BIVENTER MAXILLÆ INFERIORIS.

G, The CAROTID ARTERY.

H, The INTERNAL JUGULAR VEIN lying empty and flat.

I, The PAR VAGUM, or eighth nerve of the ſkull.

J K, Threads holding out the ſheath of cellular membrane which involves the artery, vein, and nerve.

L, The INTERNAL CAROTID ARTERY, being the great diviſion going to the cerebrum.

M, The EXTERNAL CAROTID ARTERY.

N, The FACIAL ARTERY.

O, The SUPERIOR THYROID ARTERY.

P, Its branches on the thyroid gland.

Q Q, Branches of the thyroid artery to the maſtoid muſcle.

R, The LINGUAL ARTERY.

S, The ſubmental branch of the facial artery.

T, The OCCIPITAL ARTERY.

V, The NERVUS ACCESSORIUS.

X, The ſub-maxillary gland. It is raiſed from its place and pinned to the lower jaw.

Y, The PAROTID GLAND.

Z, The duct of the parotid gland.

* Lymphatic glands of the neck.

This ſketch and ſlight explanation may be ſome guide in the diſſection of this intricate piece of anatomy. It ſhews at the ſame time that ſtage of the diſſection to which the following obſervations have reference.

PRACTICAL REMARKS TO BE DEDUCED FROM THE DEEP DISSECTION OF THE NECK.

DURING this diſſection, the attention of the ſtudent will, no doubt, be fixed upon the place of the great arch of the aorta. He will ſee the inſtantaneous death that muſt follow the ſtab of the aſſaſſin's knife in the root of the neck, which is the point at which they aim: His attention will alſo be naturally excited to the effect which muſt be produced by the aneuriſmal enlargement of this veſſel on the

ſternum, the great veins, and the trachea: He will attend to the direction of the carotid artery, and how it retires behind the cartilages of the throat, and receives protection from the maſtoid muſcle.

Seeing the deep ſituation of the carotid, and the manner in which it is ſurrounded by the ſheath of membrane, and under the compreſſion of muſcles, it will be eaſily comprehended how it is ſupported, after its coats have given way and are dilated; and obſerving how it is compreſſed on the outſide, the effects of its aneuriſmal dilatation in obſtructing the muſcles of the throat, and compreſſing the trachea, will be recollected.

No part of anatomy can more intereſt the ſurgical ſtudent than this intricate intertexture of veſſels and nerves under the angle of the jaw.

We obſerve, 1. How the platyſma myoides covers and embraces all the veſſels, even the commencement of the external jugular vein: Again, how the veſſels recede under the protection of the edge of the maſtoid muſcle. 2. We find a maſs of cellular membrane mingled with the glandulæ concatenatæ, or lymphatic glands of the neck, lying on the outſide of the jugular vein, and connected with the ſheath of the great vein and artery. Theſe are the glands which are ſo often diſeaſed, and form large hard tumours requiring operation. Obſerving their ſituation in this their natural ſtate, we may learn how far they muſt compreſs and encroach upon the veſſels before they torment the patient with the alarms of ſuffocation; and being under the preſſure of muſcles before they diſtend the integuments, they have generally ſent their roots very deep. When a gland enlarges from diſeaſe, it puſhes aſide the cellular membrane, and condenſing it, forms a firm ſheath or bed in which the gland lies: by getting through this cellular membrane, as I have obſerved, and cutting fairly down to the ſurface of the gland, or raiſing up by diſlection layer after layer the ſurrounding cellular membrane, the ſurgeon will often be able to diſſect it out from its bed with eaſe. But theſe glands, we may obſerve, during diſſection, cloſe upon the proceſſes of the cervical vertebræ. During their enlargement, therefore, they preſs down upon the bone, and form an adheſion ſo broad and intricate, that it is impoſſible to take the gland away with any certainty of eradicating the diſeaſe.

3. When theſe glands under the angle of the jaw, and before the maſtoid muſcle, enlarge, they puſh up the lobe of the parotid gland before, form firm connection with it, and are nearly incorporated with it. Hence, I have no doubt, has frequently ariſen the miſtake of the ſurgeon, that he was extirpating the parotid gland, when he was merely taking out a lymphatic gland, and perhaps alongſt with it the extended lower lobe of the parotid. Twice I have ſeen in operation the lower part of the parotid gland diſſected off with much trouble and nicety from the enlarged gland beneath.

4. Obſerving in the firſt and ſuperficial diſſection of the ſide of the neck, the manner in which the platyſma myoides covers all and ſends its ſlips upwards on the cheek, we ſhall underſtand how, by theſe means, it firmly braces down the lower part of the parotid gland; and that before we can come to the ſurface of a tumor ſeated here, we have in general to make a free inciſion through this muſcular expanſion. It may be further remarked, that the embracing of the fibres of this muſcle have, during operation, a ſtrength which the relaxed ſtate of the parts in the dead body cannot explain.

5. Obſerving the numerous branches of arteries and veins here, the ſurgeon digging in this deep cavity will perhaps endeavour to inſulate the connections of the gland rather by the finger than by the knife. But I have found the root of ſuch tumors ſtriking ſo deep by the ſide of the veſſels, that there was actually in this attempt danger of lacerating the internal jugular vein.

6. It will be obſerved from the diſſection, that the arteries which are in danger from the extirpation of tumors behind the angle of the jaw, are the continued trunk of the external carotid, or the temporal artery, the internal carotid at its acute turn, and the occipital artery. The moſt expoſed is the

temporal artery, as it aſcends under the lower part of the parotid gland. The occipital artery will be obſerved to lie very deep under the maſtoid proceſs, defended by the tranſverſe proceſs of the atlas; and no ſurgeon will attempt to go within the ſheath of the carotid and jugular vein, ſo as to endanger the internal carotid artery.

Surgeons in common practice often extirpate tumours with merely a general knowledge of the arteries, and after feeling and examining the tumour, they cut it out by merely going round the diſeaſed parts. We cannot but ſhudder to think how many operators of this kind there have been in this country, and how many there ſtill are giving themſelves out as operators, with an intention of eſtabliſhing themſelves in the ſuperior ranks of the profeſſion, with the ſin of a conſcious deficiency both of knowledge and of expertneſs. Here in the neck the ſurgeon can uſe no tourniquet to ſtem the torrent of blood, until he have cut round the diſeaſed parts: he muſt have an accurate knowledge of the parts, and diſſect ſo as to avoid danger. The want of a knowledge of this part of anatomy does not ſo much lead to raſh and fearleſs operations; but as the parts are really of ſo eſſential importance, and errors ſo fatal, the patient is put off from time to time with frivolous pretexts, until the diſeaſe becomes ſo extenſive, or the adheſions of the tumor ſo deep, and ſo widely ſpread, that no other ſurgeon can venture upon an operation.

During the diſlection of the parotid gland, we ought to attend to the peculiar granulated appearance of its ſubſtance, and be able to recogniſe it and diſtinguiſh it from the fat; a circumſtance which may perhaps appear trivial, but which obſervation, during the operations of ſeveral ſurgeons, have convinced me is really of importance. Obſerve alſo that ſometimes there is found lying on the parotid, or in its ſubſtance, a lymphatic gland, which may be diſeaſed, which I have ſeen diſeaſed, and taken out from its ſocket in the gland. We ought alſo to attend to the veſſels paſſing through the parotid gland, particularly the continued branch of the external carotid, the going off of the internal maxillary, and the tranſverſalis faciei. We ſhall be convinced from an actual view of the parts, that it is an impoſſible, or at leaſt an arduous and dangerous, attempt, to extirpate the parotid gland.

I aſſiſted my brother lately in this operation. The whole gland was diſeaſed; it was diſſected all round, until it remained attached only at that deep point which is behind the jaw bone, where it encircles the artery. A ligature was put upon its root, and in a few days it dropt off, more completely eradicated than could have been poſſible with the knife.

The following day I aſſiſted Mr. J. Walker, ſurgeon, to diſſect out a tumour from the ſame place. It would have appeared to a ſuperficial obſerver to be the ſame diſeaſe of the parotid gland; but though the tumor was firmly rooted behind the angle of the jaw, its degree of lateral motion convinced us that it was a diſeaſed lymphatic gland, rolling under its bed of cellular membrane, and the lobe of the parotid gland. Mr. Walker, therefore, laid his account with going through the cellular membrane, cutaneous muſcle, and the lobe of the parotid gland, before he touched the ſurface of the diſeaſed gland. By theſe means, without hœmorrhage, he was enabled completely to inſulate it; but finding it roots to run very deep, and the artery pulſating ſtrongly, (the tumor being in actual contact with the external carotid), he put a ligature round the root of the gland, which came away on the following day.

I alſo aſſiſted Mr. Renton on a ſimilar occaſion

When we diſſect up the parotid gland, we obſerve the ſtrong cord of nerves (the portio dura) which paſſes up through it, branching to the ſide of the face. Theſe nerves will retain the ligatures for a very long time, unleſs they are, after a few days, ſnipt acroſs. We ought to explain to the patient that there is often a ſlight diſtortion of the mouth, or a falling down of the eyebrow, from taking out tumors about the jaw.

DISSECTION OF THE NERVES OF THE ORBIT AND FACE.

To have a diſtinct view of the nerves paſſing through the orbit, and to the eye, we muſt raiſe the upper part of the orbit, ſo as to have eaſy acceſs to the parts within.

Obſerving the points at which the 4th, 5th, and 6th pairs of nerves paſs through the dura mater, we have to diſſect the dura mater up, ſo as to ſhow the further courſe of theſe nerves. We have particularly to attend to the gaſſerian ganglion, and the paſſage of the ſixth pair through the cavernous ſinus. We muſt diſſect the dura mater from the fore part of the petrous bone, and from the ſphenoid bone, ſhowing the cavity which it forms here for the lodgement of the ganglion of the fifth pair. We have to diſtinguiſh betwixt the interlacing of the membrane of the dura mater, and the branching of nerves. We ought alſo to lay open, with caution, the cavernous ſinus, and diſplay the turns of the carotid artery, and the courſe of the ſixth pair, and the beginning of the great ſympathetic nerve.

To proſecute the diſſection of theſe nerves, the frontal bone muſt be cut down to the orbit, ſo as to lay open all the outſide of the orbit; and the ſphenoid and temporal bones muſt be cut down, ſo as to lay open the foramen lacerum, and the foramina rotundum and ovale. The cheek bone ought alſo to be cut down, and the lower jaw cut through at its ſymphyſis, and the portion of the ſide you are diſſecting ought to be torn back, and left attached at the articulation.

Now you have free acceſs to the diſſection of the whole courſe of the nerves of the face.

1. We have to attend to the nerves paſſing into the orbit, viz. The 3d or MOTOR OCULI, the 4th or TROCHLEARIS, the opthalmic branch of the 5th, and the 6th, or abducens.

The diſtribution of thoſe nerves, or at leaſt their general courſe, is to be traced by diſſecting very carefully at the outer ſide of the optic nerve, where they are very much intricated with each other, and with the origines of the muſcles.

You ought then to attend to the further and minute diſtribution of theſe nerves in the orbit: 1ſt, The SUBDIVISIONS OF THE FIFTH PAIR, viz. To the lacrymal gland; to the forehead; to the lenticular ganglion; to the noſe (by paſſing again into the cranium through the internal orbital foramen). 2dly, The diſtribution of the THIRD, OR MOTOR OCULI, to the muſcles. 3dly, The formation of the LENTICULAR GANGLION, and the courſe of the FASCICULI of CILEARY NERVES.

Having followed the nerves of the orbit, you may trace the naſal branch through the foramen, by breaking up the cells of the frontal and œthmoid bones, until you find it paſſing down again with the firſt pair into the noſe, or ſending its branches into the frontal ſinuſes.

HAVING the gaſſerean ganglion and firſt great diviſion of the fifth pair already diſſected, it remains to follow the diſtribution of the ſuperior and inferior maxillary nerves.

To do this, there is much careful diſſection and patience required, particulary for the diſſection of the ſuperior maxillary nerve; for we find it lodged in the deep foſſa, behind the maxillary ſinus of the upper jaw, amongſt looſe fat. Here it ſends off many branches; and the ganglion of miekel, with the retrograde videan nerve, and the branches to the noſe and palate, are exceedingly difficult to follow.

The whole of this diſſection muſt be done by breaking up the bones, and their accidental fracture may tear away the chief point of demonſtration.

To follow the lower maxillary nerve (the third diviſion of the fifth pair is eaſier), you muſt recollect, 1ſt, The great branch to the lower jaw: 2d, The guſtatory branch into the ſubſtances of the tongue; and, 3dly, The reflected branch paſſing into the ear, the chorda tympani. Laſtly, The connections which it forms with the ninth nerve, and its twigs to the ſubmaxillary gland.

EXPLANATION OF PLATE VII.

This is a mere ſketch, ſhewing the ſtudent into what form the diſſections of the deep nerves of the neck ſhould bring the parts.

A, The ſkull cut down, ſo as more completely to lay open the tranſit of the nerves.

B B, The INTERNAL CAROTID ARTERY.

C, The INTERNAL JUGULAR VEIN.

D, The MASTOID MUSCLE.

E, The ſtylo-hyoideus, ſtylo-gloſſus, and ſtylo-pharyngeus muſcles, diſſected from their origin, and held out by a pin.

F, LONGUS COLLI and RECTUS CAPITIS ANTERIOR MAJOR.

G, Muſcular bag of the pharynx.

H, TRACHEA.

I, THYROID CARTILAGE.

K, THYROID GLAND.

L, The integuments of the ſide of the neck.

M, The HEART.

N, The PERICARDIUM.

O, Arteria inominata.

P, The CAROTID ARTERY.

Q, RIGHT SUBCLAVIAN ARTERY.

R, The VERTEBRAL ARTERY.

NERVES.

1, The SPINAL ACCESSORY NERVES, one of the three diviſions of the eighth pair.

2, The trunk of the PAR VAGUM, or principal diviſion of the eighth pair.

3, The GLOSSO-PHARYNGEAL NERVE, another diviſion of the eighth pair.

4, The ninth, or HYPOGLOSSUS, where it adheres to the eighth pair the trunk of the nerve is cut off.

5, The ninth nerve, cut from its origin, and laid forward.

6, The DESCENDENS NONI.

7, Superior cervical ganglion of the ſympathetic nerve.

8, The pharyngeal branches of the par vagum and ſympathetic nerves.

9, The trunk of the par vagum where it deſcends into the cheſt.

10 10, The recurrent branch of the par vagum.

11, The SYMPATHETIC NERVE in the neck.

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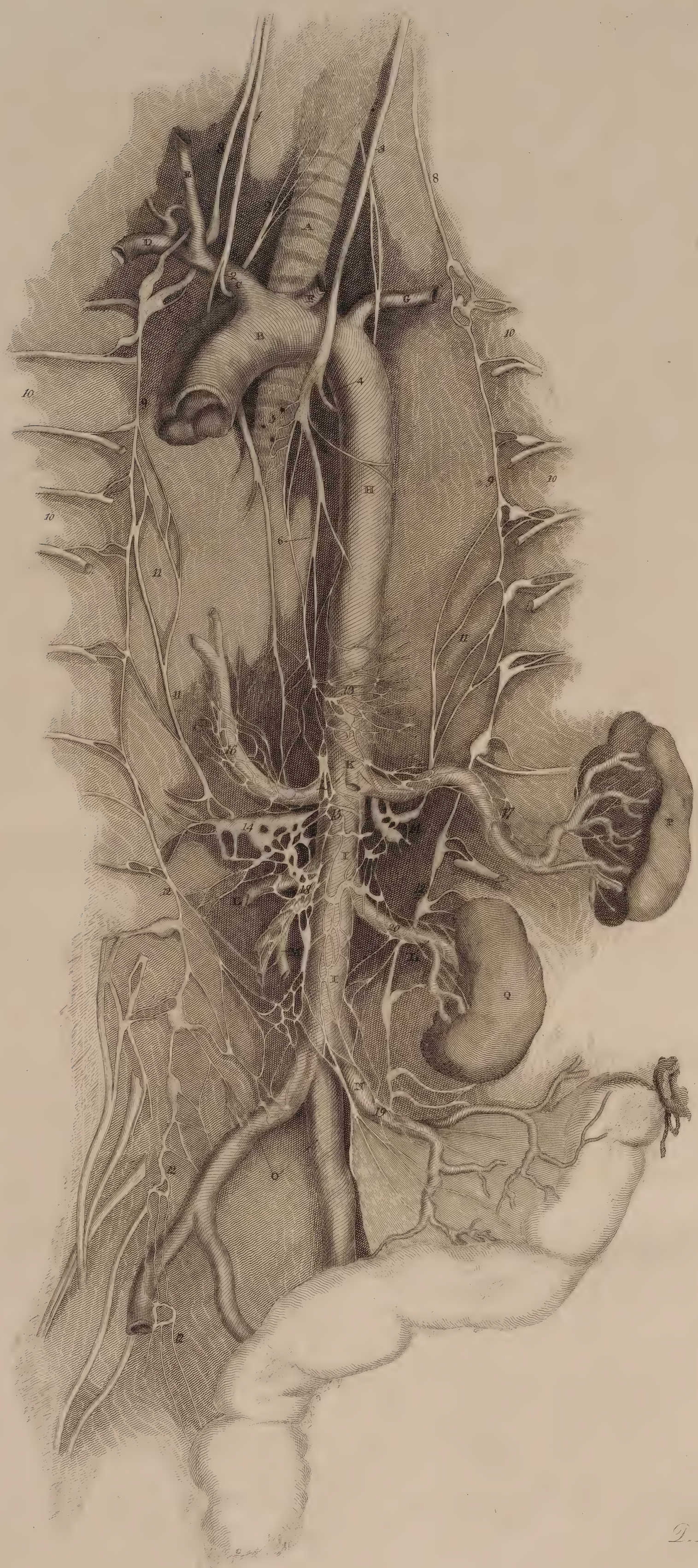

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12 12, Here the ſympathetic, ſplitting, ſurrounds the vertebral artery R, and deſcends into the cheſt.

13 13, The delicate nerves which deſcend from the par vagum, the ſympathetic, and the cervical nerves, to the heart and great veſſels.

14 14 14, &c. The CERVICAL NERVES.

15, The BRACHIAL NERVES.

16, The PHRENIC NERVE.

DISSECTION THIRD.

PROSECUTION OF THE DISSECTION OF THE LONG NERVES INTO THE THORAX AND ABDOMEN.

THE diſſector having peruſed the claſſification, and general deſcription of the courſe of the par vagum, ſympathetic, and phrenic nerves, proceeds to the diſſection of the thorax. There are two principal diſſections, 1ſt, The nerves to the heart, viz. from the ſympathetic, par vagum, and recurrens, and the phrenic, in its courſe through the thorax to the diaphragm. 2d, The proſecution of the par vagum on the oeſophagus and to the lungs, and the ſympathetic and ſplanchnic branches. To do this laſt diſſection, it will be neceſſary to cut down the ribs, preſerving only the lower margin of the thorax to keep the diaphragm diſtended; or the whole trunk may be brought into the ſhape preſented in plate III. of engravings of the nerves.

PLATE VIII.*

THIS is a mere plan of the nerves of the viſcera, being ſuch as I hang up in my claſs, to retain in the minds of the ſtudents a ſimple arrangement and view of the whole, that they may not be confounded by partial and intricate diſſections of parts. It may ſerve the ſame purpoſe here.

A, A ſketch of the TRACHEA.

B, The AORTA.

C, The ARTERIA INNOMINATA.

D, The RIGHT SUBCLAVIAN ARTERY.

E, The RIGHT CAROTID ARTERY.

F, The LEFT CAROTID ARTERY.

G, The LEFT SUBCLAVIAN ARTERY.

H, The AORTA THORACICA.

I I, The AORTA ABDOMINALIS.

* The Plate to which this explanation refers has, by the error of the Engraver, been numbered and printed off as Plate VII.

K, The COELIAC ARTERY.

L L, The EMULGENT ARTERIES.

M, The UPPER MESENTERIC ARTERY.

N, The LOWER MESENTERIC ARTERY.

O, The ILIAC ARTERIES.

P, The SPLEEN.

Q, The LEFT KIDNEY.

NERVES.

1, The PAR VAGUM.

2 2, The RECURRENT BRANCH of the right ſide, paſſing round the ſubclavian artery.

3, The par vagum of the left ſide, paſſing round the arch of the aorta.

4, Where they lie behind the root of the lungs, and give off the pulmonic plexus.

5, Where they throw a net-work of nerves around the oeſophagus.

6, Repreſents the plexus formed by the par vagum on the ſtomach.

7, SYMPATHETIC NERVES.

8, SYMPATHETIC NERVES, where they may be ſuppoſed on the ſide of the dorſal vertebræ.

9, The INTERCOSTAL NERVES giving out branches to the ſympathetic nerves.

10, Splanchnic nerves, which paſs off as diviſions of the ſympathetic in the thorax.

11, The ſympathetic nerves, where they are prolonged down upon the loins into the pelvis, continuing to receive additions from the nerves of the ſpine.

12, The PLEXUS of nerves, formed by the par vagum on the ſtomach, after they have come through the diaphragm, with the oeſophagus.

13, The great ſemilunar ganglion, formed by the ſplanchnic nerve.

14, The SOLAR PLEXUS formed on the root of the cœliac artery by ſemilunar ganglions, and the plexus of the par vagum on the ſtomach.

15, The HEPATIC PLEXUS, or that diviſion of the ſolar plexus which is continued along the hepatic artery.

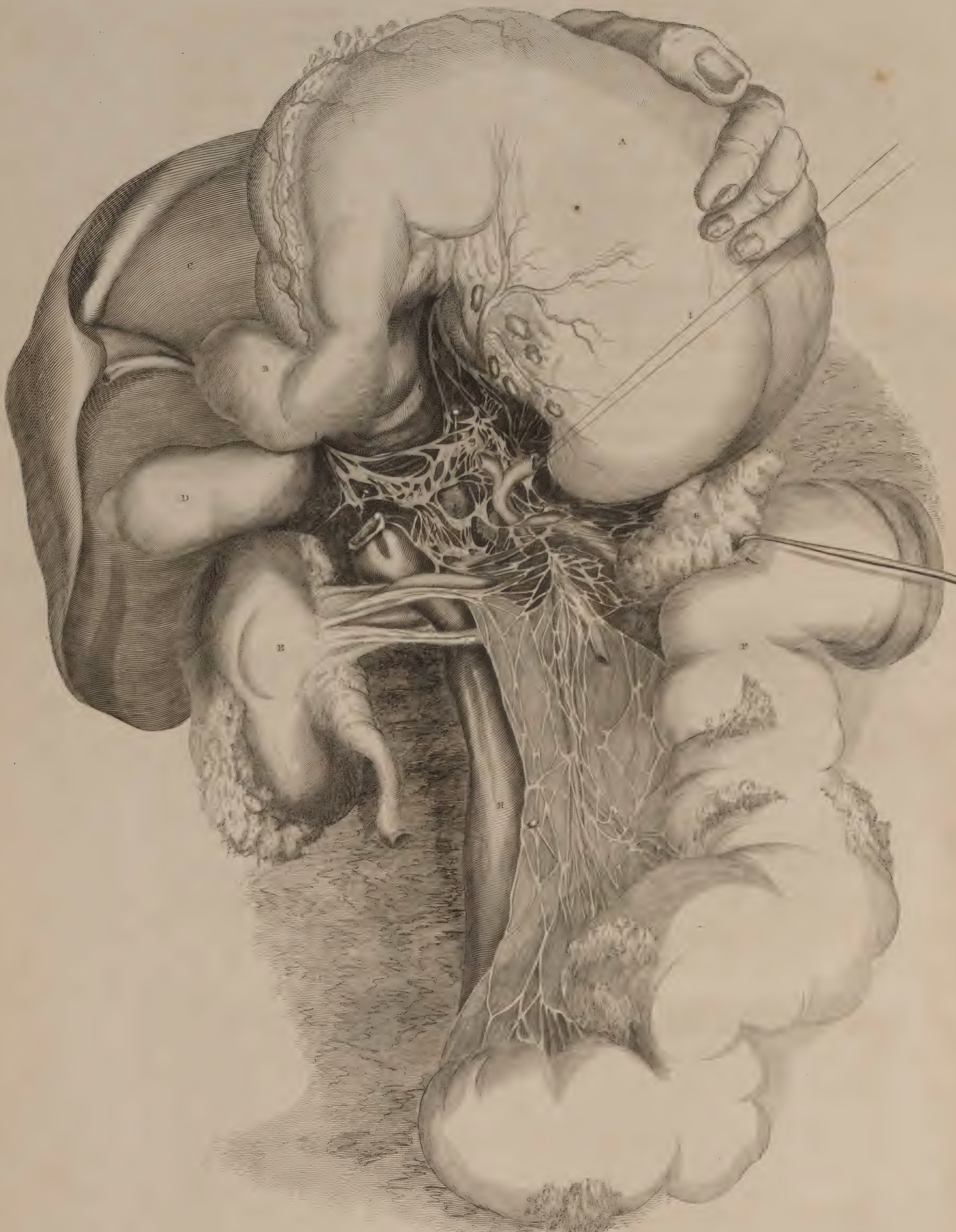
16, The SPLENIC PLEXUS, a diviſion from the ſolar plexus.

17, SUPERIOR MESENTERIC PLEXUS, formed upon the ſuperior meſenteric artery by meſhes from the ſolar ganglion and nerves from the continued ſympathetic nerves of each ſide.

18, The LOWER MESENTERIC PLEXUS, formed in the ſame way with the laſt, a meſh of nerves being continued down the whole length of the abdominal aorta.

19, PLEXUS to the KIDNEY.

Plate IX. Vol. II.



Drawn by Charles Bell

Engraved by J. Grant.

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EXPLANATION OF PLATE IX.

When we have diſſected the par vagum in its courſe through the thorax, and have traced their branches on the œſophagus, we ſee them paſſing the diaphragm with the œſophagus, to be diſtributed upon the ſtomach (the corda ventriculi); we may obſerve alſo that the right nerve becomes the more anterior of the two.

To proſecute theſe nerves, we muſt now follow their courſe in the abdomen, elevate the diaphragm, and preſs down the ſtomach, and ſhew the manner of their diſtribution to the ſuperior orifice, and along the arches of the ſtomach. Here the ſtudent naturally recurs to the conſideration of the various ſympathies explained by the courſe of this nerve, and its diſtribution to the throat, lungs, and ſtomach, &c. Having diſſected the branches of the par vagum, which are ſent to the upper ſide of the ſtomach, and down to the ſolar plexus, he then raiſes the ſtomach, and he has a view much like this preſented to him in Plate IX.

A, The stomach diſtended and held up.

B, The intestinum duodenum.

C, The liver.

D, The gall-bladder.

E, The right kidney.

F, A portion of the colon on the left ſide.

G, The pancreas held up with a hook.

H, The vena cava.

I, A thread holding out the cæliac artery.

NERVES.

1, The splanchnic nerve (ſee the preceding Plan) where it comes into the belly by the ſide of the leſſer muſcle of the diaphragm.

2, The semilunar ganglion formed by the ſplanchnic nerve.

3, 4, 5, The solar plexus, or great central ganglion of the abdomen. That part of it, 3, will be ſeen to form a connection with the par vagum.

6 6, The par vagum, or termination of the principal branch of the 8th pair.

This ſketch ſhews merely that point of the diſſection which, being carefully made, leads to the diſplay of the nervous ſyſtem of the viſcera. Thus,

Firſt, The greater portion of the ſmall inteſtines being taken away, that diviſion of the plexus which involves the fore part of the aorta, may be diſſected, which will include the ſuperior and inferior meſenteric plexus. Secondly, The diviſions to the liver and ſpleen may be proſecuted. Thirdly, The ſtudent may lay back the kidney from its ſeat, ſhew the acceſſary branches of the ſplanchnic, the continued courſe of the ſympathetic, the plexus to the kidney, and the ſpermatic pexus.

SHORT ACCOUNT OF THE MANNER OF DISSECTING THE BRAIN, FOR THE EXAMINATION OF THE MORBID APPEARANCES, AND SERVING TO DIRECT THE RESEARCHES OF THE STUDENT TO THOSE PARTS WHERE THE CHARACTERISTIC DISTINCTIONS ARE TO BE OBSERVED.

IT is not intended that there ſhould be included in this work an anatomical deſcription of the brain, but merely ſuch hints of the manner of diſſecting, and the appearances to be attended to in proſecuting, the morbid anatomy, as may aſſiſt the ſtudent in his firſt eſſays.

In general, that method of diſſecting which explains the anatomy the beſt, will alſo expoſe the diſeaſed ſtate of the brain: but there are ſome ſtates of the brain, in which to diſſect in the uſual way of tearing up the ſcull-cap, would effectually preclude us from obſerving the moſt important circumſtances of the caſe. In moſt caſes, we proceed in this manner:

Lifting the Scull-cap, we obſerve the vaſcularity of the bone, its degree of adheſion to the dura mater, the quantity, colour, and conſiſtence, of the blood effuſed, upon tearing up the connection with the membrane.

The dura mater, although it has many veſſels running in it, is rather to be conſidered as a vehicle of the veſſels of the bone, than as a membrane vaſcular, or apt to inflame. When inflamed, we ſhall find the veſſels extremely minute and diſtinct, and of a bright colour; which circumſtances may ſerve to diſtinguiſh the ſtate of inflammation from that of mere congeſtion, which is more generally marked by a profuſion of dark blood on its ſurface, pouring out from the veſſels ruptured in tearing up the ſkull-cap, with a turgidity of the longitudinal ſinus. The old phyſicians, perhaps, paid too much attention to the ſtate of the ſinuſes, attributing ſyncope, apoplexy, and a great variety of diſeaſes, to polypi and coagula in them. But we now, on the other hand, attend too little to them in morbid diſſection, ſeeing there can be no better criterion of the general ſtate of the vaſcular ſyſtem of the brain than is offered to us in the examination of the great ſinuſes.

II. Surface of the Brain. We cut the dura mater cloſe on the bone from the ſides and forepart, and ſnipping acroſs the origin of the falx from the frontal and œthmoid bone, we turn the membrane back, and expoſe the ſurface of the brain *. Here we muſt accurately obſerve the deviation from the natural ſtate of the parts; for more may be learned here of the general ſtate of the brain than by a minute examination of the internal parts. Here the veſſels are in a delicate web of membrane, and diſtinctly ſeen: their inflamed ſtate, their ſtate of congeſtion, their relaxations, the effuſions betwixt the membranes, the hardneſs, ſoftneſs, and degree of elaſticity, of the ſurface of the brain, muſt alſo be obſerved and noted down.

Under the tunica arachnoides, we very frequently obſerve a fluid exuded, which being contained under ſo very tranſparent a membrane, appears tremulous, like jelly. Such exudation is generally by the ſide of the great veins. This ſerous effuſion gives ſometimes a very beautiful tranſparency to a conſiderable part of the ſurface; ſo that the membranes, before they are cut, reſemble tranſparent glaſs. Coagulable lymph will alſo be found ſometimes effuſed on the ſurface of the brain.

The veſſels of the pia mater are found turgid with venous blood; but from this turgidity we are careful to diſtinguiſh inflammation of the meninges, where the veſſels are more numerous, the general colour brighter, with a ſuffuſed vermilion colour in the interſtices of the veſſels.

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* Viz. inveſted only with the delicate pia mater and tunica arachnoides.

The pia mater will be found diſeaſed in a great variety of ways, which require a leſs familiar acquaintance with the natural ſtate of the parts than it does to mark the more common ſigns of inflammation, &c. Thus we find it thickened, and groſs tumors upon it, or in the ſurface of the brain; little papillæ, like millet-ſeeds, formed on it, the effects of inflammation, ſuppuration, abceſs, &c. Upon raiſing the dura mater, we ſee (in the natural ſtate of the parts) no connection betwixt it and the ſurface of the brain; no tranſmiſſion of veſſels, unleſs where the veins of the pia mater, being gathered into conſiderable trunks, are entering the ſinuſes. But when inflammation, ſuch as proceeds from the injury of the bone, attacks the dura mater, or when a diſeaſe or tumor originating in the brain makes its way to the ſurface, the dura and pia mater adhere. Thus an abceſs will form in the brain, and communicate with the ſurface, but the matter will not be ſpread over the ſurface of the brain, but, confined by the adheſions of the pia mater to the dura mater, it may even, eroding the dura mater, communicate with a caries or fiſſure in the ſkull, and be diſcharged outwardly. This is the agency of the ſame laws which operate to the diſcharge of matter from the abdomen or thorax, without allowing the matter to be diffuſed over the internal ſurfaces.

In the further proſecution of the morbid anatomy of the brain, we muſt be directed by the previous knowledge of the ſymptoms, and the idea we have formed of the probable appearances. If, however, we intend to examine the ventricles carefully, the lobes and hemiſpheres muſt not be moved, nor handled roughly. By rudely ſeparating the hemiſpheres, to look down upon the corpus calloſum, or by lifting the anterior lobes to look down upon the carotid arteries, the connections of the ſoft medullary and cineritious ſurfaces within the ventricles will be torn.

First Section of the Hemispheres of the Cerebrum. Before making thoſe horizontal cuts which will expoſe the whole centrum ovale, we naturally examine a more ſuperficial ſection of the hemiſphere. Here we obſerve the degree of vaſcularity, the bloody points in the medullary centre, the more diffuſed vaſcularity of the cineritious part. It is impoſſible in words to convey an idea of the ſlight deviations from the natural degree of vaſcularity, the colours, the degree of firmneſs or elaſticity, which mark the diſeaſed ſtate of the brain. Experience muſt teach this; and all that can be effected here, is to mark out to the ſtudent ſuch points for his obſervation as may enable him ſooner to profit by his opportunities.

By inflammation, the cortical or cineritious part of the brain acquires a darker and more lurid colour, and the medullary part is fuller of bloody points, and theſe more reſemble extravaſations. There is, however, a very peculiar effect of that inflammation, which proceeds from contuſion or fracture of the ſkull. When the progreſs of this inflammation has been gradual, and inflammation has ſucceeded to the effects of the original concuſſion, we may then obſerve, that, contiguous to the injured part of the ſkull, the dura mater is thickened. If there has been extenſive fracture or perforation made by the trephin, this membrane is found ſometimes irregularly torn; upon the pia mater, a layer of coagulable lymph, with pus; and, upon making a cut into the ſubſtance of the cerebrum, we find that the brain contiguous to the injured parts has totally loſt its natural texture, as if an echymoſis had ſpread there. The colour is a mixture of a dark red and an obſcure green. This centre has either been ſo injured by the concuſſion, or is ſo unable to ſuffer the action of inflammation, that the veſſels are weakened, and allow of extravaſation. Surrounding the mottled centre, the green colour extends; and it will be obſerved, that theſe colours, the effect of diſeaſe, ſpread more extenſively alongſt the track of the outward cineritious matter, than in the medullary part of the brain. This green colour is quite peculiar to the brain, and will announce to us (during diſſection) our approach to an abceſs or tumor procceding to ſuppuration within the ſubſtance of the brain.

In making the inciſions to lay open the lateral ventricles, we muſt be aware of the waſting of the ſub-

ſtance of the brain, and the enlargement of theſe cavities. I do not mean here the caſe of long-confirmed chronic hydrocephalus, where the roof of the ventricles comes to be like a ſoft pulpy bag. But where the accumulation of water, and the dilatation of the ventricles, has encroached on the ſubſtance of the brain, in making the horizontal cut on the level of the corpus caloſum, to expoſe the centrum ovale, the knife is plunged awkwardly into the cavity of the ventricles. By ſeparating the hemiſpheres of the cerebrum, and obſerving the convexity of the corpus caloſum, or by tapping with the finger, we may judge of the quantity of fluid in the lateral ventricles; for the ventricles being now covered only by a thin layer of medullary ſubſtance, if there be much fluid, it may be perceived by its undulations.

Now, laying open the ventricle of one ſide, or lifting the corpus caloſum, we look down upon both ventricles, while the water remains, and we ſhall ſee the parts in their ſeat, and the ventricles of their natural form. Even in the acute hydrocephalus, we ſhall find the internal medullary part of the brain ſo extremely delicate, that even the ſlight agitation of the head will tear it into ſhreds. This is ſometimes ſo beautifully minute, as not to be taken for the effects of laceration during diſſection. Now, laying open the lateral ventricles more fully, we have to note the ſtate of the veins extended on the internal pia mater, and the appearance of the plexus choroides, its veſſels perhaps enlarged and varicoſe, with little bags or hydatids adhering to them; or perhaps it is hardened, and like ſchirroſity.

We now proceed, as a matter of courſe, to examine the ſtate of the communication betwixt the ventricles, to lift the fornix, and examine the VELUM INTERPOSITUM, tracing it back to the TUBERCULA QUADRIGEMINA, and to its connection with the pineal gland, carefully obſerving the ſtate of theſe bodies. Here, by examining the vena Galeni, we have the proof of the ſtate of all the internal vaſcular ſyſtem of the brain, viz. in their turgidity, marks of congeſtion, or inflammation.

In general, we have little to obſerve upon laying open the third ventricle, viz. by lifting the velum, and ſeparating the thalami nervorum opticorum. It is a narrow ſlit, unleſs when dilated by general dropſy of the cavities of the brain, or injected by extravaſated blood, which will ſometimes paſs through all the intricacies of theſe cavities.

The four great eminences of the brain, the corpora ſtriata, and the thalami nervorum opticorum, ought to be examined with moſt particular care, where we expect to find the remains of former diſeaſe, and of attacks of apoplexy antecedent to the cauſe of death.

It will now be obſerved, that, in following this plan, we ſhall have cut the brain far down towards the baſe; and that little remains of the examination of the internal parts, but to cut up the TENTORIUM, and proceed to obſerve what is remarkable in the cerebellum, and in the fourth ventricle.

OF THE BASE. In every inſtance, we muſt proceed in the diſſection according to the ideas we have received; and often we ſhall be tempted, when the ſymptoms of the diſeaſe have indicated an affection of the anterior part of the cerebrum or the baſe, to lift the anterior lobes, and look down upon the OPTIC NERVES, CAROTID ARTERY, and SELLA TURCICA. Here, of courſe, we ſhould examine, with particular care, in caſes where the orbit, or the bones of the noſe, have been diſeaſed, where a penetrating wound has been given in the eye, or bones of the face, with ſymptoms of oppreſſion; where there have been ſuppurations in the orbit, or a ſuſpicion of counter-fiſſure of the orbital plate of the frontal bone; where ulceration, or the preſſure of tumors in the noſe, has affected the œthmoid bone, and oppreſſed the brain. Here, where the internal carotid arteries riſe by the ſide of the ſella turcica, they are often diſeaſed, with oſſifications, or dilated, and have ſometimes thrown out great maſſes of coagulum. We proceed to turn back the lobes of the brain from the baſe of the ſkull, cutting the nerves in the order of the com-

mon diſſection. If the ſymptoms have led us to ſuſpect extravaſation, it will very probably be found here, from the numerous arteries and veins in the looſe tunica arachnoides of the baſe of the brain. But do not miſtake, as I have ſeen ſome do, that blood which has fallen down into the baſe of the ſkull, from the diſſection of the brain, and the opening of the great veins and ſinuſes, for the effect of rupture of the veſſels of the baſe. It may be further obſerved, that, eſpecially in inveſtigating the immediate cauſe of death, in conſequence of falls, &c. as in the inſtance of a man pitching on the head, the ſtate of the vertebræ and their ligaments, the ſheath of the ſpinal marrow, the vertebral arteries and veins, &c. are quite neglected; when the cauſe of immediate and ſudden death may be found in the oppreſſion of the ſpinal marrow, or the cauſe of lingering death with paralyſis, in the inflammation and thickening of the membranes and ſheath.

It will be readily underſtood, that, in all medical caſes, the three ſtages of the diſſection, viz. of the membranes and ſurface, of the ventricles and velum, and of the baſe, muſt be minutely noticed by the diſſector, as explanatory of the general ſtate of the encephalon.

Thus we have the common way of diſſecting the brain; but it will by no means anſwer for every caſe. For inſtance, where there is injury of the ſkull, where there is inflammation of the membranes and ſurface of the brain, if we tear up the ſkull-cap from the DURA MATER, we ſhall deſtroy all that we wiſh to examine; the ſeparation of the dura mater from the ſkull; perhaps its more firm adheſion around this detached part; the adheſion of the PIA MATER to the DURA MATER; the effuſions, the extravaſations of blood or matter on the brain. In theſe caſes, when I have my own way, and can make preparations of the parts, I diſſect from the baſe of the brain towards the ſurface, in this manner:

I ſaw through the ſkull much lower than uſual. I cut the dura mater through, not raiſing the ſkull-cap from the dura mater, but I raiſe the whole brain from the baſis of the ſkull, by letting the head drop over the table; and the brain, thus ſeparating from the baſis, I cut the NERVES where they paſs out, and the MEDULLA SPINALIS, as it deſcends through the FORAMEN MAGNUM. I have then the brain entire in the ſkull-cap. I can manage it eaſily. I ſee at once the adheſions of the membranes to the ſkull-cap, without deſtroying them, and I begin my diſſection from the baſe, cutting into the ventricles, obſerving what is uncommon in theſe cavities. They are very frequently affected by external injury, when we ſhould not have been led to expect that the affection of the brain was ſo deep; and I have frequently found the internal ſurface of the lateral ventricles more ulcerated, irregular, and their cavities fuller of pus, from fracture of the ſkull, than even the ſurface of the brain.

Often, too, we ſhall find, in injuries of the head from external violence, that the abceſſes formed in the ſubſtance of the hemiſpheres of the CEREBRUM, penetrate deep, and are cut acroſs by the knife.

In this way of diſſecting, the preparation is complete; for, gradually as you approach the ſuperior part, or the ſurface in contact with the injured bone, you find the inflamed or diſeaſed appearance becoming more remarkable; you can trace the ſpreading of the inflammation from the centre of the injured parts, examine and yet preſerve the adheſions of the membranes, and obſerve the effect of the ſpoiled or dead cranium, in exciting the inflammation of the brain, and the quantity of matter, &c. Laſtly, when you have completed the diſſection, you have not deſtroyed the preparation.

The young anatomiſt will find little advantage in the hardening of the brain by maceration in the oxygenated muriatic acid, or any other chemical proceſs, to facilitate the diſſection. But if he is diſſecting for the mere anatomy, and regardleſs of the natural colours, he would do well to have the head minutely injected with a ſtrong jelly or ſize, which gives to the brain a fine elaſticity and firmneſs, and exudes into the cavities, ſo as to make an elegant diſplay of the ventricles.

SOME OBSERVATIONS ON THE DISSECTION OF THE EYE.

Before the ſtudent proceeds to the diſſection of thoſe coats of the eye, which are called the proper coats, he muſt obſerve what is meant by the acceſſory or adventitious coats, viz. the tunica conjunctiva, or adnata; the albuginea, formed by the expanded tendons of the muſcles; and the apparatus for ſecreting the tears, and for abſorbing and conveying them into the noſe.

The tunica conjunctiva he finds to be the inner membrane of the eye-lid, reflected over the ſurface of the eye, ſo as to prevent foreign bodies from paſſing deep into the ſocket. He ought to attend to the ſeat of the lacrymal glands, by diſſecting down the upper eye-lid, and pulling it from its ſituation under the roof of the orbit. He ought alſo to obſerve the puncta lacrymalia on the edge of the eyelids, near the inner angle; the caruncula lacrymalia; the membrana ſemilunaris.

A careful obſervation ſhould alſo be made of the ſituation of the lacrymal ſac and duct; the relation it bears to the ligament of the tarſus, to the angular artery, to the ſtrong point of the naſal proceſs of the upper maxillary bone, and its ſeat in the os unguis. An opportunity muſt be taken of tracing the duct down to its opening in the noſe, under the lower ſpongy bone, and of obſerving particularly the direction of the ſtilet in the operation for the fiſtula lacrymalis.

Upon taking out the eye, the ducts of the lacrymal gland ſhould be examined; the meibomian ducts and the cebaceous glands; which laſt will be ſeen to be attached to the little common duct, by diſſecting up the delicate membrane from the inſide of the eye-lid.

OF THE DISSECTION OF THE PROPER COATS OF THE EYE.

Having diſſected the eye-ball free of all parts external to the ſclerotic coat, I ſhould adviſe this method of proceeding: lay the eye in a flat diſh, and pour round it warm jelly, ſo that juſt the ſurface of the ſclerotic coat be above the jelly, and a ſmall part of the margin of the cornea. When the jelly has congealed, it keeps the eye-ball uniformly ſupported and ſteady, and prevents the neceſſity of ſuch preſſure on the coats as would make the vitrious humour burſt through the choroid coat or retina, upon our making the inciſion of the ſtrong outer coat. The inſtruments muſt be nice and ſharp; two pairs of ſmall forceps, a lancet, pointed knife, and very delicate ſciſſars, and blow-pipe.

With the ſharp lancet, by repeated ſcratches, cut up a portion of the ſclerotic coat; then inſinuating the point of the ſciſſars under it, raiſe a triangular flap. Under the ſclerotic, the choroid coat, of a dark brown colour, will be recogniſed; veſſels and nerves will be ſeen paſſing from the ſclerotic to the choroid coat; the nerves running forward betwixt the ſclerotic and choroid coats to the iris: the arteries of the choroid will be diſtinguiſhed from the veins, by their running forward, and in a direction nearly parallel; while the larger veins, when they have perforated the ſclerotic coat (inwa d) ſend out their branches, diverging from the centre in all directions, ſo as to have the name of vasa vorticosa *.

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* This is on the preſumption that the veins and arteries of the eye are injected; if they are not, they will appear like a fibrous ſtructure in this choroid coat.

A general black colour will be obſerved to pervade the ſubſtance of the choroid coat; and upon teazing up this outer ſurface of the choroid coat, we have what is conſidered as the proper choroid coat, while the inner ſurface is the TUNICA RUYSCHIANA.

Upon turning back a portion of the dark choroid coat, you find a black pigment on its under ſurface, the pigmentum nigrum. If the ſubject is not perfectly freſh, the black matter will be looſe and floating; part of it will alſo adhere to the ſurface of the retina, which is now ſeen lying under the choroid, and under the pigmentum nigrum.

The retina will be found whitiſh, or having a conſiderable degree of opacity. By dropping a little weak acid upon it, it will become more opaque and ſtronger, and the veſſels upon the inſide will be more obſcurely ſeen; but if we turn up a portion of the retina, we ſee the veſſels on its inner ſurface ſtill diſtinct, and running apparently without any membrane to ſupport them. This, however, is owing to the perfect tranſparency of the inner ſurface of the retina; and theſe ramifications are a proof that there is a membrane here, the lamina vaſculoſa tunicæ retinæ; while that which is external, and contiguous to the pigmentum nigrum, is the medullary portion of this internal coat, called retina, and the ſeat of the ſenſe.

Returning to the ſclerotic coat, and cutting it further up towards the cornea, we have to attend to the connections of the iris and ciliary proceſſes, and chambers of the aqueous humours. We find, upon carefully diſſecting up the moſt anterior part of the ſclerotic coat, that there is a whitiſh kind of band which connects the outer circle of the iris and the ciliary circle with the ſclerotic coat. This circular connection beſt deſerves the name of ciliary ligament. When we have taken up a conſiderable piece of the pelucid cornea, we can then obſerve the ſize of the anterior chamber of the aqueous humor; and the ſituation of the iris, the nature of the pupil, and the ſituation of the lens. The lens will be ſeen with its anterior convexity cloſe upon the pupil, or perforation of the iris; and the greater poſterior convexity will alſo be obſerved, when you look from behind.

Now, the ſtudent ought to turn in his mind all the precepts he has received regarding the operations of extracting and couching the cataract; for now he can underſtand that the great principle of extracting the opaque lens is, that the vitrious humor being compreſſed, protrudes the lens through the dilated pupil. He may now convince himſelf, by obſerving the nearneſs of the lens to the iris, of the very ſmall quantity of the aqueous humour contained behind the iris, and the impoſſibility of depreſſing the lens (by the operation of couching) into the poſterior chamber of the aqueous humor, there being no ſuch cavity. He will obſerve alſo the point at which the needle for couching ought to be introduced, and the direction of the needle, ſo as to transfix the cataract. In ſhort, he muſt now ſtudy the parts, and truſt to no verbal deſcription; for ſuch is the uſe of diſſection.

We will obſerve further in this view, that where the choroid coat advances forward, it is as it were confined, ſo as to form plicæ; and theſe paſſing inward, touch the margin of the lens. Now, obſerving the place of theſe CILIARY PROCESSES, introduce your hook, transfix the lens, and bring it away; and now you will obſerve that theſe ciliary proceſſes are very ſhort; are like one circle within the larger circle of the iris; and that there is no ſpace betwixt theſe and the iris; that when the lens is depreſſed, it is unſocketed from theſe connections, and lies under the vitrious humor.

OF PREPARING THE RETINA FOR DEMONSTRATION. Suppoſe that we make ſections of the eye, with the intention of ſtudying the ſtructure of the optic nerve and retina, we diſſect and follow the coats of nerve until we find them terminating in the coats of the eye. In making a ſection of the optic nerve, we can now trace the ARTERIA CENTRALIS RETINÆ through the PORUS OPTICUS; and the medullary matter of the nerve itſelf through the LAMINA CREBROSA. When we have made a ſection of the eye, ſo as to ſee the

back of lens and the ciliary proceſſes, we may obſerve that the retina ſeems to terminate at the root of the circle of the ciliary body, or corona ciliaris, as I have called it. But here the opaque and medullary part of the retina only terminates; the tranſparent part of it is continued inward; not only touches the lens, but paſſes over its back part. By pouring a little vinegar on the retina, the opaque medullary part will become more opaque, but the veſſels on the inſide will not be obſcured. To demonſtrate the vaſcularity and membraneous nature of the retina further, float it in water, ſo that its outer ſurface may be expoſed; then take a ſolution of the cauſtic alkali, and with a hair pencil waſh away the outer medullary ſurface; then only will there remain the web of membrane, which ſerves as a baſe to the medullary part: or float the whole retina in a very weak ſolution of the alkali, and then it will appear that the medullary part is gradually diſſolved, and there only remains the delicate and tranſparent web of membrane, full of veſſels; which tranſparent membrane is the baſe upon which the medullary part is as it were ſuperimpoſed.

When the web of the retina is minutely injected, and thus prepared, it may be hung in ſpirits, and then the veſſels are ſeen beautifully ramifying; while the membrane which conveys them being tranſparent, is not diſcernable; and this I conceive muſt have been the manner in which Ruyſh muſt have prepared the veſſels of the retina, ſo as to repreſent them as he has done in his works.

Of the petitian canal. To demonſtrate this canal, we may cut off an anterior ſegment from the eye, leaving the lens ſeated on the forepart of the vitrious humor. To do this, the ſclerotic coat muſt be carefully cut in the circle, a little behind the cornea; then the choroid coat, with the ciliary body and iris, raiſed carefully from the connection to the forepart of the vitrious humor. Obſerving now the margin of the lens, we perceive that the membrane of the vitrious humor appears to be reflected over it. Puncturing at this place, and blowing gently with the blow-pipe, you find that the air paſſes in the circle round the margin of the lens, forming a canal, like a chain of regular veſicles: or, inſtead of uſing the blow-pipe, to adapt it for demonſtration, the point of the mercurial injecting tube may be forced into the angle betwixt the lens and vitrious humor, and a few drops of quick-ſilver allowed to fall into it, when they will ſhow a connected chain of globules running round the lens.

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